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DEC 19 1997

DOE-0270-98

Mr. James A. Saric, Remedial Project Manager
U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF THE INTEGRATED ENVIRONMENTAL MONITORING QUARTERLY REPORT

This letter provides transmittal of the Department of Energy's (DOE) first Integrated Environmental Monitoring Quarterly Report. Sampling under the Integrated Environmental Monitoring Plan (IEMP) was initiated in August 1997 following approval of the plan in July 1997. This report includes data collected under both the IEMP and its predecessor programs, and therefore, represents a transition to the IEMP reporting framework. It is expected that the contents and future format of quarterly reports will evolve as the IEMP is fully implemented and stakeholder input is incorporated. To facilitate this evolution, written responses will be provided for all comments received. Given the frequency of IEMP reporting, however, quarterly reports will not be revised, instead, actions resulting from comments will be incorporated into subsequent reports.

After evaluating the data provided in this quarterly report, the DOE recommends one modification to the natural resource monitoring program defined in Appendix D of the IEMP. The IEMP currently requires visual monitoring of sediment loading to Paddys Run following each storm event to assess impacts to Sloan's Crayfish habitat. Visual observations conducted since February 1997 indicate that sediment loading is primarily derived from upstream sources and that turbid conditions persist for only one day or less following rainfall events. The observations confirm that existing site storm water controls, and associated routine inspections of these controls, provide adequate protection to Sloan's

Crayfish Habitat. Based on this finding, DOE recommends discontinuing the visual monitoring of Paddys Run following each storm event. Routine inspection of sediment controls will continue to ensure continued protection of this habitat.

To assist in the review of this document, the raw data used in developing this report will be submitted in an electronic format during the week of January 6, 1998.

Should you have any questions regarding this submittal, please contact Kathleen Nickel at (513) 648-3166.

Sincerely,

Johnny Reising

FEMP:Nickel

Johnny W. Reising
Fernald Remedial Action
Project Manager

Enclosure: As Stated

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INTEGRATED ENVIRONMENTAL MONITORING STATUS REPORT FOR THIRD QUARTER 1997

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

DECEMBER 1997

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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INTEGRATED ENVIRONMENTAL MONITORING STATUS REPORT FOR THIRD QUARTER 1997

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

DECEMBER 1997

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

DRAFT

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LIST OF ACRONYMS

AMS	air monitoring station
BTV	benchmark toxicity values
CFR	Code of Federal Regulations
cfs	cubic feet per second
D&D	decontamination and dismantlement
DMEPP	Design Monitoring and Evaluation Program Plan
DMRs	discharge monitoring reporting
DOE	U.S. Department of Energy
EMP	Environmental Monitoring Plan
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facilities Compliance Agreement
FRL	final remediation level
gpm	gallons per minute
IEMP	Integrated Environmental Monitoring Plan
mg/L	milligrams per liter
mrem	millirem
NESHAP	National Emissions Standards for Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
OEPA	Ohio Environmental Protection Agency
OSDF	on-site disposal facility
pCi/L	picoCuries per liter
pCi/m^3	picoCuries per cubic meter
PRRS	Paddys Run Road Site
RA	remedial action
RAV PSP	Restoration Area Verification Sampling Program, Project Specific Plan
RCRA	Resource Conservation and Recovery Act
ROD	record of decision
SER	Site Environmental Report
SOWC	Southwestern Ohio Water Collector
TLD	thermoluminescent dosimeter
TOC	Total Organic Carbons
TOX	Total Organic Halogens
TSP	total suspended particulate
$\mu g/L$	micrograms per liter

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) has prepared this report to meet the first quarterly reporting obligation defined in the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997c) for the Fernald Environmental Management Project (FEMP). The IEMP-sponsored quarterly status report represents one component of the overall reporting strategy presented in the IEMP. It is intended to provide a timely, incremental assessment of environmental data that is aligned with the remediation time line to ensure that contaminant releases attributable to the implementation of FEMP's sitewide remediation activities remain within established thresholds. As such, the quarterly status report serves as the fundamental tool for the monitoring-based decision-making process outlined in Section 1.5 of the IEMP. The other component of the IEMP reporting strategy consists of a comprehensive annual report that provides a detailed roll-up of the environmental data, associated findings and actions captured in the quarterly reports. The annual report primarily serves as a detailed historical accounting of the monitoring activities and results from the previous year while fulfilling a number of compliance-related reporting requirements (e.g., groundwater section of the Resource Conservation and Recovery Act [RCRA] Annual Report and National Emissions Standards for Hazardous Air Pollutant [NESHAP] Subpart H Compliance Report). It is intended that together, the quarterly and annual reports will serve as the foundation for communicating environmental data in an accessible, manageable format that can be used effectively by Fernald stakeholders in a collaborative decision-making process.

The primary objectives of the IEMP quarterly status report are to:

- Provide a current summary of key environmental data which can be used as a tool to track and assess the collective effectiveness of site emission controls and thus support an effective decision-making process as outlined in Section 1.5 of the IEMP.
- Support Fernald stakeholders by providing a timely assessment of off-property impacts associated with implementation and operation of remediation activities at the FEMP.
- Document the performance of the groundwater remedy for the Great Miami Aquifer.
- Document the status of natural resource impacts and activities.

Sampling activities under the IEMP were initiated in August following approval of the plan in July 1997. Thus, the data provided in this report reflect primarily pre-IEMP monitoring activities which were conducted under various implementing documents prior to integration under the IEMP.

Nonetheless, the data evaluation criteria for each environmental media outlined in the IEMP have been used to the extent possible as the basis for assessing the data and for determining the need for any associated IEMP or project-specific actions. Environmental data collected in 1997 that have been reported previously through other reporting mechanisms are either not included in this report or included only in summary form, as necessary, to assist in the IEMP-specified data-evaluation process. Each of the media-specific sections identify the data included in the evaluation.

Consistent with the format of the IEMP, this status report is organized around the principal environmental media and contaminant migration pathways routinely monitored under the plan. Each media-specific section of the report provides a summary of the data currently available for the period beginning January 1 through September 30, 1997. However, the data sets available for each media-specific monitoring program vary, based on program sampling schedules and analytical complexity. It should be noted that for this initial quarterly status report, the reporting period has been extended beyond the quarterly focus as outlined in the IEMP. This extended reporting period is required to provide a sufficient data set for conducting meaningful data evaluations and to establish the initial environmental baseline on which future quarterly reports will continue to build. The media-specific sections of this report and their content are as follows:

- **Groundwater Monitoring Update (Section 1.0)** - This section summarizes the groundwater monitoring activities and available analytical results for the reporting period. An operational summary of the Aquifer Restoration Program and assessment of the restoration progress is provided along with summaries of analytical data from the RCRA Property Boundary, On-Site Disposal Facility (OSDF), and Private Well monitoring programs.

- **Surface Water and Treated Effluent Update (Section 2.0)** - This section summarizes the surface water and treated effluent monitoring activities and available analytical results for the reporting period. The activities and results summarized include the National Pollutant Discharge Elimination System (NPDES) permit compliance monitoring, sampling activities supporting the application for NPDES permit renewal, surface water and treated effluent monitoring conducted under the Federal Facilities Compliance Agreement (FFCA), treated effluent monitoring to assess compliance with the Operable Unit 5 Record of Decision (DOE 1996), and routine surface water monitoring under the pre-IEMP Environmental Monitoring Plan (EMP) (FERMCO 1995).

- **Air Monitoring Update (Section 3.0)** - This section summarizes the air monitoring activities and available analytical results for the reporting period. A monitoring summary of the pre-IEMP radiological air particulate monitoring program, radon monitoring, direct radiation measurements, and NESHAP stack emission monitoring is

included. In addition, summaries of air monitoring activities associated with project-specific decontamination and dismantlement activities, and a research project on site-specific particle size distributions are provided.

- **Natural Resources Update (Section 4.0)** - This section summarizes the monitoring activities and results associated with assessing potential impacts to natural resources including cultural resources, impacted habitat acreage, wetland delineation, and surveys of threatened and endangered species, including Sloan's Crayfish.

Sediment and biota data collected during the annual sampling events in 1997 will be included in the June 1998 transitional IEMP annual report, as referenced in IEMP Sections 5.6.2 and 7.6.2, respectively.

To meet the IEMP quarterly reporting objectives, each media-specific section provides the following:

- Summary of the monitoring activities (pre-IEMP, IEMP, and project-specific) included in the report
- Definition of the reporting period associated with each data set
- Summary presentation of the data utilizing figures and tables
- Summary of findings and future focus.

Highlights of the findings for each media-specific section are presented below:

Groundwater Monitoring Update (Section 1.0)

- South Plume Module Operation

  The module continues to operate in the four-well, 1,400 gallons per minute (gpm) optimum pumping configuration.

  Each well was operational for at least 96 percent of the time during July through September.

  Since August 1993, the system has pumped 2.6 billion gallons of groundwater, resulting in a removal of 363.5 pounds of uranium from the Great Miami Aquifer.

- South Plume Capture Assessment

  Capture of the main portion of the South Plume with negligible impact to Paddys Run Road Site (PRRS) plume continued during July through September.

Uncertainties regarding hydraulic capture of the northeastern lobe of the South Plume have resulted in the initiation of additional evaluation. Results of this evaluation will be presented in the next quarterly status report.

- Remedy Construction

  Work continues on the installation of two new recovery wells comprising the South Plume Optimization Module.

  Construction is underway on the pipeline distribution network for three groundwater restoration modules: South Plume Optimization Module, South Field Extraction Module (Phase I), and the Injection Demonstration Module. These modules are scheduled to begin operation during 1998.

- RCRA Property Boundary Data Summary

  Consistent with previous monitoring data, occasional final remediation level (FRL) exceedances for total chromium, manganese, and zinc were detected outside the projected 10-year, uranium-based restoration footprint. These locations will continue to be monitored and a more comprehensive evaluation will be completed when sufficient data is available.

- On-site Disposal Facility Baseline Sampling

  Sampling activities were initiated in the Great Miami Aquifer in March 1997 with 12 sampling rounds completed as of October 1997 for Cell 1.

Surface Water and Treated Effluent Update (Section 2.0)

- NPDES Permit Compliance

  The NPDES permit limits were achieved 99.8 percent of the time from January through September. Permit excursions were limited to total suspended solids during treatment system bypass events.

- FFCA and Operable Unit 5 Record of Decision Compliance

  A total of 112 pounds of uranium were discharged to the Great Miami River from January through September. This discharge represents approximately 19 percent of the annual limit of 600 pounds.

  The site achieved compliance with the future limit of 20 micrograms per liter (μg/L) monthly flow weighted average in effluent discharged to the Great Miami River during January through September. However, the 20 μg/L effluent limit does not become enforceable under the provisions of the Operable Unit 5 Record of Decision until January 1, 1998.

- Surveillance Monitoring Results

There were no FRL or benchmark toxicity value (BTV) exceedances observed in the Great Miami River.

As expected, occasional FRL and BTV exceedances were observed in on-property drainages to Paddys Run. These occasional, sporadic exceedances are to be expected until remediation is fully completed. Due to the recent implementation of the IEMP sampling programs, insufficient data are currently available to fully evaluate trends in the data. It is anticipated that future data collected under the IEMP will allow for more comprehensive interpretation of the significance of these exceedances.

Total uranium concentrations in surface water flowing off property at Paddys Run were consistently below both the surface water and groundwater FRLs.

Since installation of engineering controls in the Pilot Plant Drainage Ditch in 1996, total uranium concentrations in this drainage ditch have decreased dramatically.

No surface water total uranium FRL exceedances were observed during the reporting period.

Air Monitoring Update (Section 3.0)

- Pre-IEMP Radiological Air Particulate Monitoring

Total uranium and total suspended particulate (TSP) results collected from the pre-IEMP air monitoring network were within historical ranges and did not exhibit any increasing trends.

The maximum estimated dose at the facility fenceline from January through September (based on the uranium results only) was 0.15 millirem (mrem) which equals 1.5 percent of the NESHAP annual dose limit of 10 mrem.

- Transition to a monitoring based NESHAP Subpart H Compliance Program

Installation of the eight new high volume air monitoring stations and relocation of one existing monitoring station on the FEMP property boundary is complete. The NESHAP compliance monitoring network consisting of 18 monitoring stations will begin compliance monitoring on January 1, 1998.

- Radon Monitoring

During January through September, there were three exceedances of the 100 picoCuries per liter (pCi/L) radon limit specified in DOE Order 5400.5. The three exceedances were detected in continuous radon monitors located immediately adjacent to the K-65 silos. They were of short duration and were not observed outside the immediate vicinity of the K-65 exclusion fence. As in the past, these exceedances were associated with particularly strong atmospheric inversions rather than with any

operational change associated with the K-65 Silos. Based on the limited occurrence, short duration, and limited areal affect of the exceedances, no additional action is planned.

- Direct Radiation Monitoring

  All monitoring results from environmental direct radiation measurements (via thermoluminescent dosimeter [TLD]) were within historical ranges and exhibited no increasing trends.

- NESHAP Stack Emissions Monitoring

  The available data for the four monitoring locations were within historical ranges. There have been no significant changes in the operational configuration of the source operations associated with the monitored stacks or trash compactor area, which could contribute to a significant increase in emissions.

Natural Resources Update (Section 4.0)

- Sloan's Crayfish Monitoring

  Extensive monitoring to determine the persistence of sediment loading to the creek in the vicinity of the Sloan's Crayfish habitat indicates that sediment loading following rainfall events is primarily derived from the upstream reaches of Paddys Run rather than the FEMP. Monitoring observations indicate the sediment loading persists for only one to two days following the rainfall event; therefore, it is proposed that the ongoing monitoring of sediment loading to Paddys Run, as described in Section D.3.0 of the IEMP, be eliminated.

- Impacted Habitat

  To date, the impacted habitat comprises approximately 85 acres (28 percent) of the projected total impact of 305 acres expected to be impacted by remediation activities (projected impact based on Natural Resource Impact Assessment) (DOE 1997d).

- Cultural Resources

  There were a total of five unexpected cultural resource discoveries. None were significant enough to require additional data collection.

- Delineation of Additional Wetlands

  A total of approximately 0.5 acre of jurisdictional wetlands are identified during January through September 1997. These additional wetland areas were identified after the approval of the sitewide wetland delineation by the Army Corps of Engineers in August 1993. Impacts to these wetland areas will be identified in future revisions of the Natural Resource Impact Assessment.

The sitewide focus of the monitoring activities and data evaluation process defined in the IEMP serve to provide an independent verification that there are no unacceptable compounding environmental effects resulting from the concurrent implementation and operation of multiple remediation projects. This process serves as the foundation for the structured decision-making framework established in Section 1.5 of the IEMP, which is designed to support a full range of management decisions regarding the overall control of the FEMP's individual remediation projects. Consistent with this framework, the findings and any associated future actions presented in this report have been independently reviewed by the Fluor Daniel Fernald Oversight and Project Integration division. The results of this review indicate that no further actions beyond those identified in this report are required at this time. However, consistent with the IEMP evaluation protocol, future findings will be reviewed quarterly to determine if it is necessary to implement additional IEMP and/or project-specific actions.

As this document represents the first quarterly status report following implementation of the IEMP, it serves to begin the transition process to the IEMP reporting framework. It is expected that the content and format of future quarterly status reports will evolve as the IEMP is fully implemented and stakeholder input is received and incorporated. To facilitate this process, DOE will provide a written response to any comments received. However, actions resulting from the comments which require a change to the report or reporting format will be incorporated into subsequent reports.

1.0 GROUNDWATER MONITORING UPDATE

1.1 INTRODUCTION

Figure 1-1 summarizes groundwater data included in this section. As required in Section 3.7.2 of the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997c), this section addresses groundwater monitoring data and analysis results from July 1 through September 30, 1997 as follows:

- Operational assessment of the Aquifer Restoration System
- Assessment of the restoration progress.

In the past, several distinct groundwater reports (the semi-annual South Plume Removal Action Design Monitoring and Evaluation Program Plan (DMEPP) System Evaluation Report, the annual Resource Conservation and Recovery Act (RCRA) Report, the annual Site Environmental Report (SER), and the annual KC-2 Warehouse Removal Action/Well 67 report), which were prepared on different schedules and issued on different dates, are being discontinued. All groundwater data routinely collected at the Fernald Environmental Management Project (FEMP) will now be reported in the IEMP quarterly status reports.

As a result of the transition from the previous reporting formats and schedules, this first IEMP quarterly status report contains 1997 data collected over past quarters that has not yet been reported through the above-mentioned documents. This previously collected data includes:

- Final remediation level (FRL) exceedances observed at RCRA Property Boundary Monitoring Program wells for the first and second quarters of 1997
- Analytical results from the Private Well Monitoring Program sampled from January through July 1997.

This section of the quarterly status report also provides information on the available groundwater monitoring data associated with the On-Site Disposal Facility (OSDF) as noted in Section 6.1 of the On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan (DOE 1997e).

The operational data and results of groundwater monitoring for the South Plume DMEPP for January 1 through June 30, 1997 were presented in the September 1997 DMEPP report (DOE 1997j) and, as such, are not reported here.

1.2 OPERATIONAL SUMMARY

Figure 1-2A shows the IEMP groundwater monitoring wells by module/activity and Figure 1-2B shows the IEMP routine water-level (groundwater elevation) monitoring wells.

During this reporting period, the South Plume Module was the only operational element of the aquifer remedy. Figure 1-3 shows the location of the monitoring and recovery wells for the South Plume Module, and Tables 1-1 through 1-5 and Figures 1-4 through 1-10 present the operational data for this recovery system.

As shown in Tables 1-1 through 1-4, the South Plume recovery wells were operational for at least 96 percent of the reporting period. Recovery Well 3924 (RW-1) was out of service for three days in September for routine well screen maintenance. With this exception, the system operated at the optimum 1,400 gallons per minute (gpm) pumping rate during the reporting period, with Recovery Wells 3924 and 3925 (RW-1 and RW-2, respectively) pumping at 300 gpm each, and Recovery Wells 3926 and 3927 (RW-3 and RW-4, respectively) pumping at 400 gpm each. Recovery Well 3928 (RW-5) has been shut down since December 1995 and will remain shut down because it is no longer needed to meet system objectives.

Figures 1-4 through 1-7 show the monthly total uranium concentrations in the each of the four South Plume recovery wells from system startup in August 1993 through September 1997. Recovery Well 3924 (RW-1) continues to show a steady total uranium concentration of approximately 40 micrograms per liter (μg/L), while Recovery Wells 3925 and 3926 (RW-2 and RW-3, respectively) continue to show increasing total uranium concentrations as the plume front is drawn toward the wells. Recovery Well 3927 (RW-4) continues to show a steady total uranium concentration around 2 μg/L.

Figure 1-8 shows the daily total uranium concentration data measured in the South Plume discharge water, while Figure 1-9 shows the monthly average total uranium concentrations for the system since startup in August 1993. Figure 1-10, which is a graph of the cumulative total uranium removed plotted against cumulative water pumped from the South Plume wellfield, provides an indicator of system performance through September 1997.

During the reporting period, 182 million gallons of groundwater were pumped and 25.3 pounds of uranium were removed from the Great Miami Aquifer for an average system efficiency of 0.14 pounds

of uranium removed per million gallons pumped. Since operation began in August 1993, the system has pumped 2.6 billion gallons of groundwater and has removed 363.5 pounds of uranium from the aquifer. The long-term system efficiency remains at 0.14 pounds of uranium removed per million gallons of water pumped.

1.3 ASSESSMENT OF RESTORATION PROGRESS

1.3.1 Remedy Construction

Two South Plume Optimization wells (RW-6 and RW-7) are currently being installed off property in the South Plume area near the center of the plume (See Figure 1-3). Well installation has been completed for the wells comprising the South Field Extraction Module (Phase I) and the Injection Demonstration Module. Furthermore, construction is underway on the pipeline distribution network, which will convey groundwater from the extraction wells and treated groundwater to the injection wells. These three additional remediation modules are scheduled to begin operating during 1998, as identified in the Remedial Action Work Plan for Aquifer Restoration at Operable Unit 5 (DOE 1997h).

1.3.2 Groundwater Elevation Data and Capture Assessment

Groundwater elevation data collected from Type 2 and Type 3 monitoring wells in January, April, July, and September 1997 are shown in Figures 1-11 through 1-18, respectively. Generally, the Type 2 and Type 3 elevation surfaces are similar in shape for the same measurement period. The January and April data are shown in this report because the September 1997 DMEPP report included elevation data only in the area around the South Plume Module. Not all the IEMP groundwater elevation wells were measured in January, April, and July because the IEMP sampling program was not initiated until August.

A comparison of the water elevation maps indicate that groundwater flow directions across the site are generally consistent from one quarter to the next. The highest groundwater elevations occurred in April and July 1997, and the lowest groundwater elevations occurred in January and September 1997. Generally, seasonal groundwater elevations fluctuated by an average of approximately two to three feet over the site during the time in which measurements were taken. Groundwater mounding from aquifer recharge beneath Paddys Run was observed in July 1997 as shown in Figure 1-15.

The groundwater elevations in the South Plume recovery wells for January and April 1997 are estimated for those months based on previous system performance measures. The groundwater elevations in the South Plume recovery wells for July and September are actual measured elevations and reflect the increased efficiencies of the wells after they were rehabilitated.

The interpreted capture zones plotted on the Type 2 well elevation maps indicate that the South Plume Module continues to capture the main portion of the South Plume with continued negligible impact to the Paddys Run Road Site (PRRS) plume. This is confirmed by the August 1997 colloidal borescope data presented in Figures 1-19 through 1-26. The data in these figures have been filtered to remove outliers. These individual measurements are summarized in Figure 1-27, where the flow directions are plotted with the interpreted capture zones from the July and September groundwater elevation maps. The capture zones interpreted from groundwater elevation data generally are consistent with the flow directions indicated from the colloidal borescope data. The most significant difference between the colloidal borescope flow directions and the interpreted capture zones are at Monitoring Wells 2552 and 3552, which are southwest of the recovery system and just east of Paddys Run. Colloidal borescope data from these two wells indicate flow directions to the east toward the recovery system in Monitoring Well 2552 and to the north in Monitoring Well 3552. While the capture zone data interpreted from groundwater elevation maps indicate these two wells are outside the capture zone, the colloidal borescope data is believed to be more accurate. Therefore, the two wells are interpreted to be within the capture zone of the recovery system.

A modeled capture zone for the 1,400 gpm pumping configuration is shown in Figure 1-28. The predicted model capture zone confirms the capture zone derived from the groundwater elevation maps in the central and western portion of the plume. However, to the northeast of the recovery well system, in the vicinity of the northeast lobe of the South Plume (Figure 1-28), groundwater flow directions predicted by the model differ approximately 45 to 90 degrees from the flow directions interpreted using groundwater elevation measurements (comparison of Figures 1-11 through 1-18 to Figure 1-28). Modeled flow directions in the area of the northeast lobe are just west of south, while the flow directions interpreted from the groundwater elevation maps in this area are to the southeast. The difference between the modeled flow directions and flow directions interpreted from measured groundwater elevations raises a concern regarding the full hydraulic capture of the northeast lobe under the current 1,400 gpm South Plume pumping scenario. As shown in Figure 5-15 of the Baseline Remedial Strategy Report (DOE 1997b), this portion of the plume is modeled to be well within the

capture zone of the combined South Plume, South Plume Optimization, South Field Extraction Phase I, and Reinjection Demonstration Systems when they are all brought on line in 1998 as scheduled in the Remedial Action Work Plan for Aquifer Restoration at Operable Unit 5.

However, due to the uncertainty regarding full capture of this lobe in the six to eight month interim until the additional systems are brought on line, additional evaluation of the northeast extent of the hydraulic capture is warranted. The evaluation will consist of colloidal borescope measurements in wells located in the vicinity of the northeast lobe. Additionally, other sources of influence to area hydraulic gradients (such as the Southwestern Ohio Water Collector [SOWC] wells) will be evaluated to determine if current conditions are consistent with those modeled (e.g., a significant increase in the pumping rates of the SOWC collector wells over those rates currently in the model could explain the difference between the modeled versus measured flow directions in this area). The results of this evaluation, along with any proposed additional actions, will be presented in the next quarterly status report or sooner, if warranted.

1.3.3 Transitional Analytical Data and Remediation Assessment

As mentioned above, the 1997 analytical data for the South Plume Module through June 30, 1997 were presented in the September 1997 DMEPP report, and therefore, will not be repeated here. However, analytical data from the RCRA Property Boundary Monitoring Program collected in the first and second quarters of 1997 have not been presented elsewhere, and therefore, are summarized in this status report. As discussed in Section 3.7.2 of the IEMP, a more extensive presentation of all the 1997 RCRA Property Boundary Monitoring Program analytical data will be given in the transitional IEMP annual report scheduled to be issued in June 1998.

With respect to the RCRA Property Boundary Monitoring Program, there were two modifications made in early 1997. Beginning in January 1997, the list of constituents monitored was modified to reflect the recommended constituent list identified in the 1996 RCRA Annual Report (DOE 1997a). This list was approved by the Ohio Environmental Protection Agency (OEPA) and is the same list identified in the IEMP. Another modification to the monitoring program was the plugging and abandonment of Monitoring Well 2754. Because this well is not representative of aquifer conditions, OEPA gave approval to abandon and replace this well. The replacement well is Monitoring

Well 22198, which is also sampled for the on-site disposal facility program. Monitoring Well 2754 was sampled for the last time in April 1997 and Monitoring Well 22198 was sampled for the first time in April 1997 for the RCRA Property Boundary Monitoring Program.

Figure 1-29 and Table 1-6 show the FRL exceedances for the RCRA Property Boundary Monitoring Wells for January and April 1997. Occasional exceedances for total chromium, manganese, and zinc were detected from monitoring wells located outside the projected 10-year, uranium-based restoration footprint. When the remainder of the 1997 property boundary sampling results are compiled, a comprehensive evaluation of all FRL exceedances found outside the 10-year, uranium-based restoration footprint will be completed. The evaluation will be completed utilizing the methodology established in the approved Restoration Area Verification Sampling Program, Project Specific Plan (RAV PSP) (DOE 1997i). The results of this evaluation will be presented in the transitional IEMP annual report for 1997.

1.4 ON-SITE DISPOSAL FACILITY BASELINE SAMPLING

In accordance with the Final On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan, prior to waste placement, 12 sampling events are to be completed to establish a baseline for the on-site disposal facility Great Miami Aquifer wells and the horizontal till wells. Baseline sampling for Cell 1 of the on-site disposal facility was initiated in March 1997 by sampling aquifer Monitoring Wells 22201 and 22198. Baseline sampling for Cell 2 was initiated in June 1997 at aquifer Monitoring Wells 22200 and 22199 (See Figure 1-30). From March through June, six aquifer sampling events were completed and validated for Cell 1. Only one event was completed and validated for Cell 2 during this time. The horizontal till well for Cell 1 was not in place for this reporting period. Leachate samples will be collected from the Leachate Collection System and the Leak Detection System as soon as construction has been completed.

As specified in the On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan, 16 parameters are to be sampled in the on-site disposal facility Great Miami Aquifer monitoring wells. Of these parameters, five were detected in the Great Miami Aquifer (in the March through June sampling for Cells 1 and 2): technetium-99, total uranium, boron, total organic halogens (TOX), and total organic carbon (TOC) (see Table 1-7). No concentrations were above the FRLs for these constituents.

After cell-specific baseline sampling has been completed, a determination will be made as to whether sufficient data are available to select an appropriate statistical method and associated statistical measure. This determination is anticipated to be made on a parameter-, monitoring point-, system- (i.e., aquifer groundwater, perched groundwater, Leachate Collection System, and Leak Detection System), and cell-specific basis. Also, once sufficient samples to establish a baseline are available, the sampling frequency for that location will be reduced from monthly to quarterly. The cell-specific evaluations will be summarized in cell-specific technical memoranda and will be submitted with subsequent IEMP status reports. Additionally, the available monitoring data (prior to completion of baseline) will be made available quarterly as part of the IEMP status reports.

1.5 PRIVATE WELL MONITORING

Figure 1-31 shows the private well locations which were sampled from January through July 1997, and Table 1-8 summarizes the analytical results for the same time period. All private wells sampled from January through July 1997 are included in the figure and table. Only three of these private wells (12, 13, and 14) will continue to be sampled, as specified in the IEMP.

The results in Table 1-8 indicate that Private Wells 12 (also referred to as Monitoring Well 2060), 13, and 14 were the only wells which had total uranium concentrations above the naturally occurring background range of 0.1 μg/L to 3.1 μg/L as determined in the Remedial Investigation Report for Operable Unit 5 (DOE 1995). Private Wells 12 and 13, which had total uranium concentrations above the 20 μg/L FRL for total uranium are both located within the modeled 10-year, uranium-based restoration footprint of the remediation system. Although Private Well 14 is outside the restoration footprint, the maximum observed concentration in this well was 3.2 μg/L with an average of 2.8 μg/L. All three private wells will continue to be monitored as part of the IEMP.

1.6 FINDINGS AND FUTURE FOCUS

The principal findings from the reporting period are summarized below:

- **South Plume Module Operation** - The module continues to operate in the four-well, 1,400 gpm optimum pumping configuration with each well operational for at least 96 percent during July through September. During July through September, 182 million gallons of groundwater were pumped, and 25.3 pounds of uranium were removed from the Great Miami Aquifer. Since system startup in August 1993, 2.6 billion gallons of water have been pumped resulting in a removal of 363.5 pounds of uranium.

- **South Plume Capture Assessment** - Capture of the main portion of the South Plume with negligible impact to the PRRS plume continued during July through September. To address the uncertainty regarding hydraulic capture of the northeastern lobe of the South Plume, DOE is continuing to collect groundwater flow data in the vicinity of the northeastern edge of the total uranium plume, as shown on Figure 1-28. The results of this evaluation, along with any proposed additional actions, will be presented in the next quarterly status report or sooner, if warranted.

- **Remedy Construction** - Work continues on the installation of the two new recovery wells comprising the South Plume Optimization Module. Additionally, construction is underway on the pipeline distribution network for three groundwater restoration modules: South Plume Optimization Module, South Field Extraction Module (Phase I), and the Injection Demonstration Module. These modules are scheduled to begin operating during 1998, in accordance with the schedules established in the Remedial Action Work Plan for Aquifer Restoration at Operable Unit 5.

- **RCRA Property Boundary Data Summary** - Consistent with previous monitoring data, occasional FRL exceedances for total chromium, manganese, and zinc were detected outside the projected 10-year, uranium-based restoration footprint during this reporting period in some of the RCRA Property Boundary Monitoring Program wells, as shown in Figure 1-29 and Table 1-6. Due to the sporadic and isolated nature of the exceedances, no new actions are warranted prior to implementation of the sitewide aquifer restoration. When the remainder of the 1997 property boundary sampling results are compiled, a comprehensive evaluation of all FRL exceedances found outside the 10-year, uranium-based restoration footprint will be completed utilizing the methodology established in the approved RAV PSP. The results of this evaluation will be presented in the transitional IEMP annual report which will be issued in June 1998.

- **On-Site Disposal Facility Baseline Sampling** - Sampling activities were initiated in the Great Miami Aquifer in March 1997 with 12 sampling rounds completed as of October 1997 for Cell 1. Based on evaluation of data collected through June 1997, only five of the 16 parameters monitored were detected, and of the detections, no FRL exceedances were observed.

Figure 1-32 shows the groundwater monitoring activities that have been and will be conducted in 1997. The figure supplements Figure 1-1 and shows what data will be reported in future IEMP quarterly status reports. Under the IEMP, groundwater sampling has been initiated in the South Field Extraction, Waste Storage Area, and the Plant 6 Area Modules. Sampling activities for the South Plume Module, the RCRA Property Boundary Monitoring Program, Private Well Monitoring Program, and at the KC-2 Warehouse Monitoring Program are continuing.

The next IEMP quarterly status report will be issued in March 1998 and will contain operational data and the plume capture assessment for the South Plume Module from October 1 through

December 31, 1997, and analytical results from sampling activities conducted from July 1 through September 30, 1997.

TABLE 1-1

RECOVERY WELL 3924 (RW-1)
OPERATIONAL SUMMARY SHEET
FOR JULY 1 TO SEPTEMBER 30, 1997

Reference Elevation (feet above mean sea level [AMSL]) - 531.9 (top of casing)
Northing Coordinate ('83) - 474,219.7
Easting Coordinate ('83) - 1,348,314.3

Hours in reporting period - 2,208 Hours pumped - 2,134 Target pumping rate - 300 gpm
Hours not pumped - 74 Operational percent - 96.6

Monthly Measurements at Wellfield				
Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
7/97	296	13.2	44	0.37
8/97	296	13.2	45	0.38
9/97[a]	272	11.8	42	0.35
		Total 38.2	Quarterly Average 44	Average 0.37

[a]Recovery well was out of service for 3 days due to well screen maintenance.

TABLE 1-2

RECOVERY WELL 3925 (RW-2)
OPERATIONAL SUMMARY SHEET
FOR JULY 1 TO SEPTEMBER 30, 1997

Reference Elevation (feet AMSL) - 540.3 (top of casing)
Northing Coordinate ('83) - 474,319.7
Easting Coordinate ('83) - 1,348,565.4

Hours in reporting period - 2,208 Hours pumped - 2,176 Target pumping rate - 300 gpm
Hours not pumped - 32 Operational percent - 98.6

Monthly Measurements at Wellfield				
Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
7/97	303	13.5	30	0.25
8/97	301	13.5	32	0.27
9/97[a]	294	12.7	33	0.28
		Total 39.7	Quarterly Average 32	Average 0.27

[a]Recovery well was out of service for 1 day due to maintenance activities.

TABLE 1-3

RECOVERY WELL 3926 (RW-3)
OPERATIONAL SUMMARY SHEET
FOR JULY 1 TO SEPTEMBER 30, 1997

Reference Elevation (feet AMSL) - 585.0 (top of casing)
Northing Coordinate ('83) - 474,428.6
Easting Coordinate ('83) - 1,348,837.5

Hours in reporting period - 2,208 Hours pumped - 2,167 Target pumping rate - 400 gpm
Hours not pumped - 41 Operational percent - 98.1

Monthly Measurements at Wellfield				
Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
7/97	399	17.8	11	0.09
8/97	399	17.8	11	0.09
9/97[a]	379	16.4	12	0.10
		Total 52.0	Quarterly Average 11	Average 0.09

[a]Recovery well was out of service for 2 days due to maintenance activities.

TABLE 1-4

RECOVERY WELL 3927 (RW-4)
OPERATIONAL SUMMARY SHEET
FOR JULY 1 TO SEPTEMBER 30, 1997

Reference Elevation (feet AMSL) - 589.0 (top of casing)
Northing Coordinate ('83) - 474,541.8
Easting Coordinate ('83) - 1,349,127.3

Hours in reporting period - 2,208 Hours pumped - 2,178 Target pumping rate - 400 gpm
Hours not pumped - 30 Operational percent - 98.6

Monthly Measurements at Wellfield				
Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
7/97	398	17.8	1.2	0.01
8/97	398	17.8	1.2	0.01
9/97[a]	388	16.7	1.2	0.01
		Total 52.3	Quarterly Average 1.2	Average 0.01

[a]Recovery well was out of service for 1 day due to maintenance activities.

TABLE 1-5

WELL FIELD OPERATIONAL SUMMARY SHEET THROUGH SEPTEMBER 30, 1997

Total gallons pumped this reporting period (M gal) - 182
Total uranium removed this reporting period (lbs) - 25.3
Average system efficiency this reporting period (lbs/M gal) - 0.14
Gallons pumped from August 1993 to September 1997 (billion gal) - 2.6
Total uranium removed from August 1993 to September 1997 (lbs) - 363.5
System efficiency from August 1993 to September 1997 (lbs/M gal) - 0.14

Monthly Measurements at Storm Water Retention Basin Valve House

Month	Monthly Average Well Pumping Rates (gpm)					Total System Pumping Rate (gpm)	Water Pumped from Recovery Wells (M gal)	Water Treated from Recovery Wells (M gal)	Total Uranium Concentration from South Plume System (μg/L)[a]		
	3924	3925	3926	3927	3928				Min.	Max.	Avg.
7/97	296	303	399	398	0	1396	62.3	46.1	10.1	20.7	16.6
8/97	296	301	399	398	0	1395	62.3	25.0	10.0	21.1	16.2
9/97	272	294	379	388	0	1333	57.5	37.1	10.4	28.2	17.2

[a]These concentrations represent both the concentrations that are sent to treatment and to the outfall.

TABLE 1-6

RCRA BOUNDARY MONITORING PROGRAM WELL DATA ABOVE FINAL REMEDIATION LEVELS
(1988 through 2nd Quarter 1997)

Constituent	Monitoring Well	Number of Validated Samples[a,b]	Number of Validated Samples with FRL Exceedances[a,b]	Number of Validated Samples with FRL Exceedances for 1st & 2nd Quarter 1997[a,b]	FRL[c]	Validated Results with FRL Exceedances for 1st & 2nd Quarter 1997 Sample Result; Validation Qualifier; (Date Sampled)
Total Chromium					0.022 mg/L[d]	(mg/L)
	2398	17	5	2		0.0522 - (1/8/97) 0.0477 - (4/2/97)
	41217	15	2	1		0.0362 - (1/14/97)
Manganese					0.90 mg/L	(mg/L)
	2424	17	4	1		1.33 - (1/15/97)
	2426	16	3	2		1.47 J (1/8/97) 0.98 J (4/7/97)
	2431	15	2	2		2.2 - (1/7/97) 0.988 J (4/2/97)
Nickel					0.10 mg/L	(mg/L)
	2398	17	3	2		0.14 - (1/8/97) 0.103 - (4/2/97)
Zinc					0.021 mg/L	(mg/L)
	22198[e]	1	1	1		0.0474 J (4/1/97)
	2424	17	5	1		0.0476 J (4/2/97)
	2426	16	3	1		0.0363 J (1/8/97)
	4398	19	1	1		0.0495 - (1/8/97)
	4424	16	1	1		0.0298 J (4/2/97)
Uranium, Total					20 μg/L	(μg/L)
	2106	27	17	2		45.3 J (1/6/97) 67.092 J (4/1/97)
	2398	22	2	1		28 J (4/2/97)
	3069	29	14	2		252 - (1/8/97) 333.716 J (4/1/97)

Note: Highlighting indicates well is within the 10-year, uranium-based restoration footprint.
[a]If there was more than one sample result per day (e.g., a duplicate sample), then only the maximum sample concentration was counted and compared to the FRL.
[b]Rejected data qualified with either a R or Z was not used in this comparison.
[c]From OU5 ROD, Table 9-4
[d]FRL based on Chromium VI, from OU5 ROD, Table 9-5
[e]This well was only sampled during the second quarter of 1997 because installation was not complete for the first quarter sampling round.

TABLE 1-7

OSDF DETECTED RESULTS FOR MARCH THROUGH JUNE 1997

Constituent	Monitoring Well	Number of Validated Samples[a,b]	Number of Validated Samples with Detections[a,b]	FRL[c]	Sample Result; Validation Qualifier; (Date Sampled)[a,b,d]
Total Organic Carbon				NA[e]	(mg/L)
	22198	6	6		0.96 - (3/31/97) 6.3 J (4/30/97) 1.4 - (5/14/97) 2.8 J (5/28/97) 2.4 J (6/17/97) 2.8 J (6/25/97)
	22199	1	1		3.5 J (6/25/97)
	22200	1	1		3.28 - (6/30/97)
	22201	6	6		13.7 - (3/31/97) 1.9 - (4/30/97) 4.1 J (5/14/97) 1.5 - (5/28/97) 3.4 - (6/17/97) 2.5 J (6/25/97)
Total Organic Halogens				NA[e]	(mg/L)
	22198	6	4		0.0526 - (4/30/97) 0.0264 J (5/14/97) 0.0222 - (5/28/97) 0.014 - (6/25/97)
	22200	1	1		0.0073 - (6/30/97)
	22201	6	5		0.078 J (3/31/97) 0.061 - (4/30/97) 0.0265 J (5/14/97) 0.0268 - (5/28/97) 0.0202 - (6/25/97)
Boron				0.33 mg/L	(mg/L)
	22198	6	4		0.0723 - (3/31/97) 0.0558 - (4/30/97) 0.0511 - (5/14/97) 0.0577 - (5/28/97)
	22201	6	4		0.0575 - (3/31/97) 0.07 - (4/30/97) 0.0812 - (5/14/97) 0.0869 - (5/28/97)
Technetium-99				94.0 pCi/L	(pCi/L)
	22198	6	1		17.56 J (6/25/97)
	22201	6	1		21.57 J (6/25/97)

TABLE 1-7
(Continued)

Constituent	Monitoring Well	Number of Validated Samples[a,b]	Number of Validated Samples with Detections[a,b]	FRL[c]	Sample Result; Validation Qualifier; (Date Sampled)[a,b,d]
Uranium, Total				20 μg/L	(μg/L)
	22198	6	6		2.906 - (3/31/97) 1.36 J (4/30/97) 3.12 - (5/14/97) 2.45 - (5/28/97) 0.801 - (6/17/97) 0.767 J (6/25/97)
	22199	1	1		0.608 J (6/25/97)
	22200	1	1		1.11 J (6/30/97)
	22201	6	5		5.196 - (3/31/97) 0.697 - (5/14/97) 0.125 - (5/28/97) 0.08 - (6/17/97) 0.174 J (6/25/97)

[a]If there was more than one sample collected per well per constituent per day (e.g., a duplicate sample), then only the maximum sample concentration was counted and compared to the FRL.
[b]Rejected data qualified with either a R or Z was not included in this count.
[c]From OU5 ROD, Table 9-4
[d]Only detected results are reported.
[e]NA = Not Applicable

TABLE 1-8

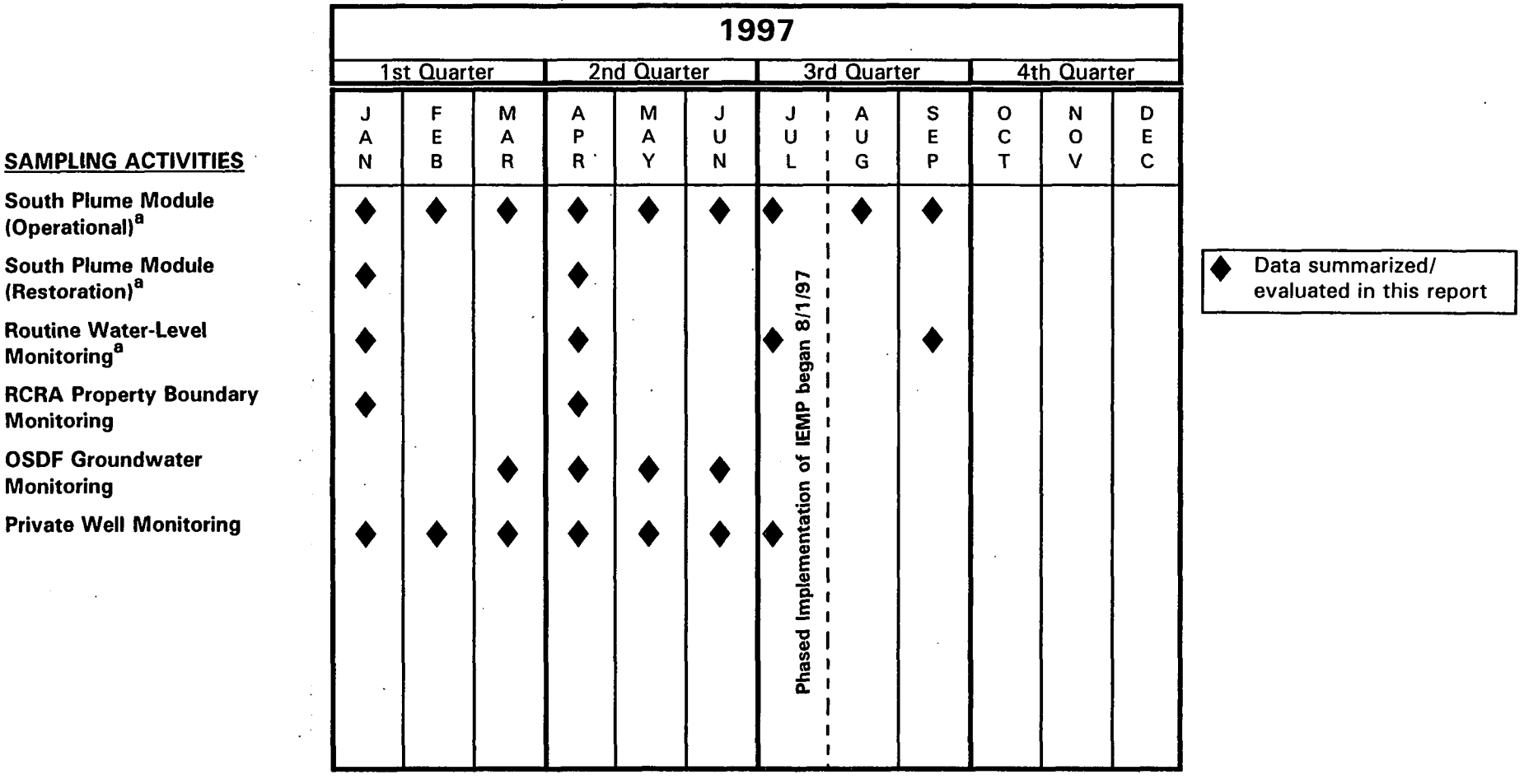
SUMMARY STATISTICS FOR PRIVATE WELL MONITORING PROGRAM
(January through July 1997 Data)

Constituent	Private Well Number	Number of Samples[a]	Number of Samples with FRL Exceedances[a]	FRL[b]	Minimum[a,c] (μg/L)	Maximum[a,d] (μg/L)	Average[a,e] (μg/L)	Results with FRL Exceedances for January through July 1997 Sample Result; (Date Sampled)[f]
Uranium, Total				20 μg/L				(μg/L)
	3	7	0		0.05	0.05	0.05	
	4	7	0		1.7	2.2	1.9	
	8	7	0		0.7	0.9	0.8	
	9	7	0		1.5	1.6	1.6	
	10	7	0		0.6	0.7	0.6	
	12 (2060)	7	7		21	141	83	119 (1/22/97) 43 (2/27/97) 52 (3/27/97) 141 (4/23/97) 21 (5/28/97) 106 (6/25/97) 100 (7/23/97)
	13	7	7		29	64	45	40 (1/22/97) 29 (2/27/97) 38 (3/27/97) 43 (4/23/97) 64 (5/29/97) 39 (6/26/97) 61 (7/23/97)
	14	7	0		2.5	3.2	2.8	
	22	7	0		0.7	0.9	0.8	
	29[g]	4	0		0.3	0.6	0.4	

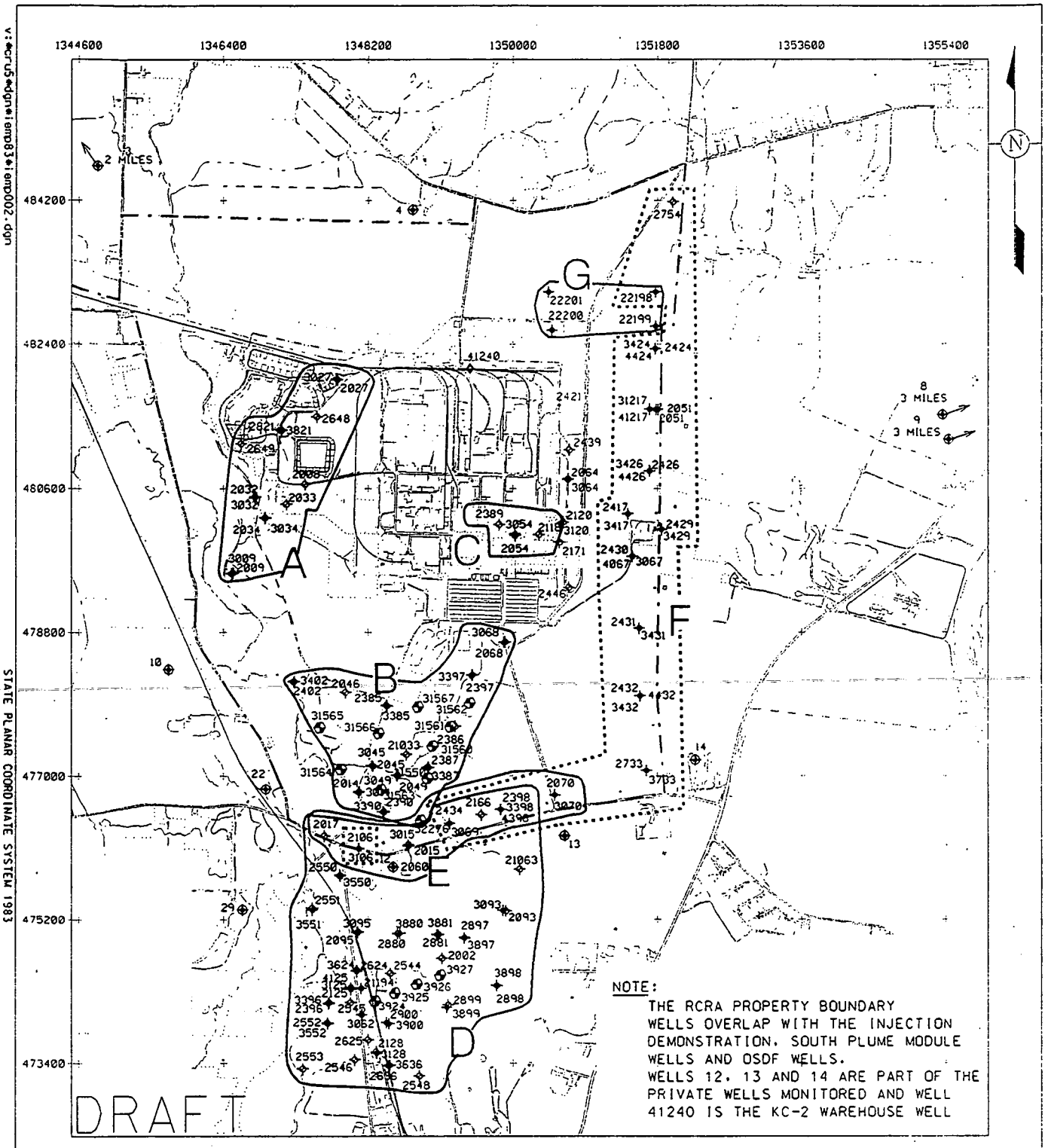
[a]If there was more than one sample collected per well per day (e.g., a duplicate sample), then the sample with the maximum concentration is used.
[b]From OU5 ROD, Table 9-4
[c]For values where the lowest concentration is below the detection limit, the minimum value is set at half the detection limit.
[d]For values where the highest concentration is below the detection limit, the maximum value is set at half the detection limit.
[e]For sample results below the minimum detectable concentration (MDC), one half the MDC is used for the sample value.
[f]Validation qualifier for all the data is NV.
[g]This well was only sampled from January through April 1997.

FIGURE 1-1

GROUNDWATER SAMPLING ACTIVITIES COVERED IN THIS REPORT



[a]Reported in the semi-annual DMEPP System Evaluation Report submitted to EPA and OEPA in October 1997



LEGEND:

- A - WASTE STORAGE AREA
- B - SOUTH FIELD EXTRACTION AREA
- C - PLANT 6 AREA
- D - SOUTH PLUME AREA
- E - INJECTION DEMONSTRATION AREA
- F - RCRA PROPERTY BOUNDARY WELLS
- G - OSDF MONITORING WELLS
- — · — · — FEMP BOUNDARY

DISTANCE AND DIRECTION FOR OFF-MAP WELL FROM CENTER OF PRODUCTION AREA

MONITORING WELL

RECOVERY WELL

PRIVATE WELL

SCALE

1800 900 0 1800 FEET

FIGURE 1-2A. IEMP WATER QUALITY MONITORING WELLS AND RECOVERY WELLS FOR 1997 AND 1998

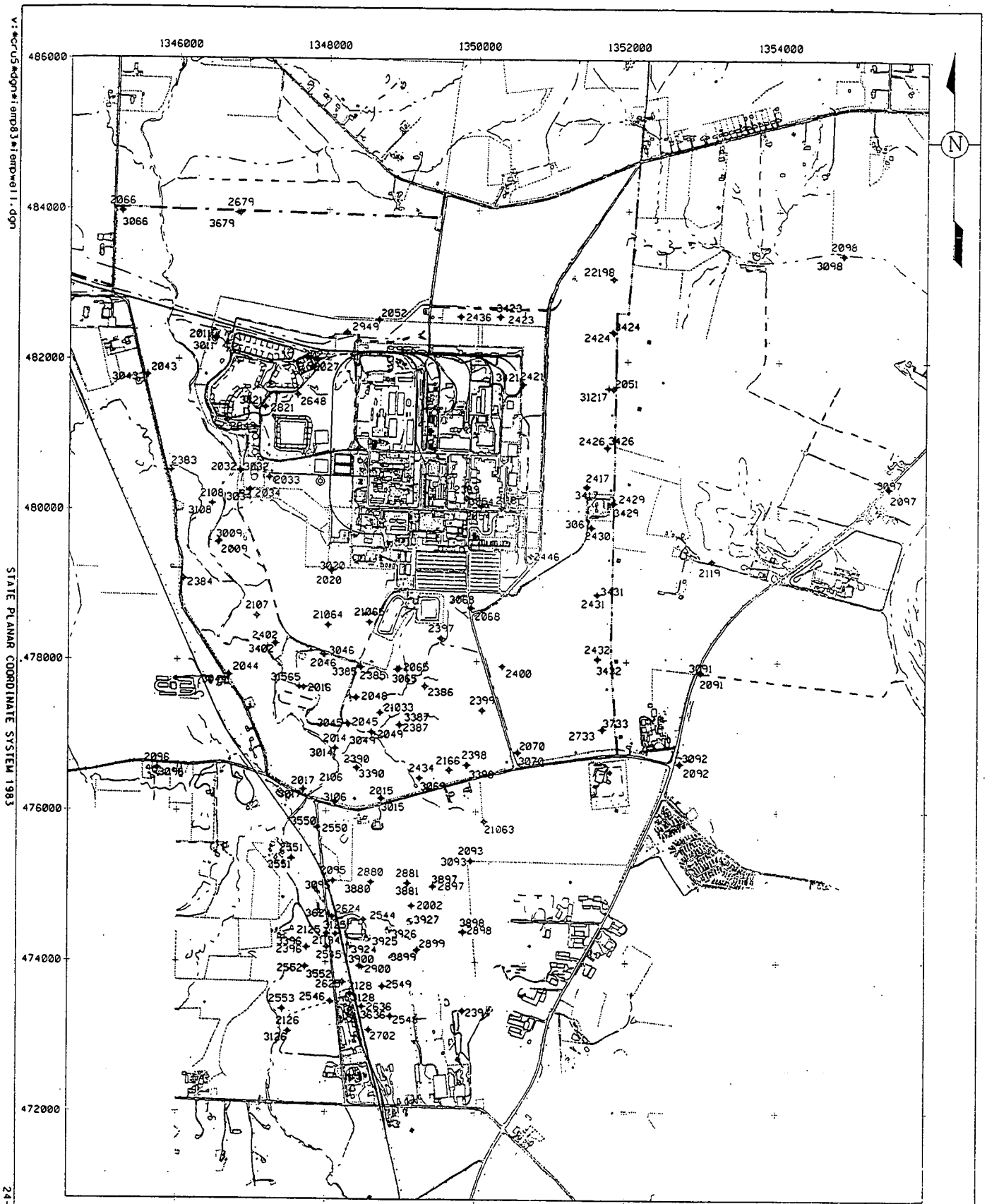


FIGURE 1-2B. IEMP GROUNDWATER ELEVATION MONITORING WELLS FOR 1997 AND 1998

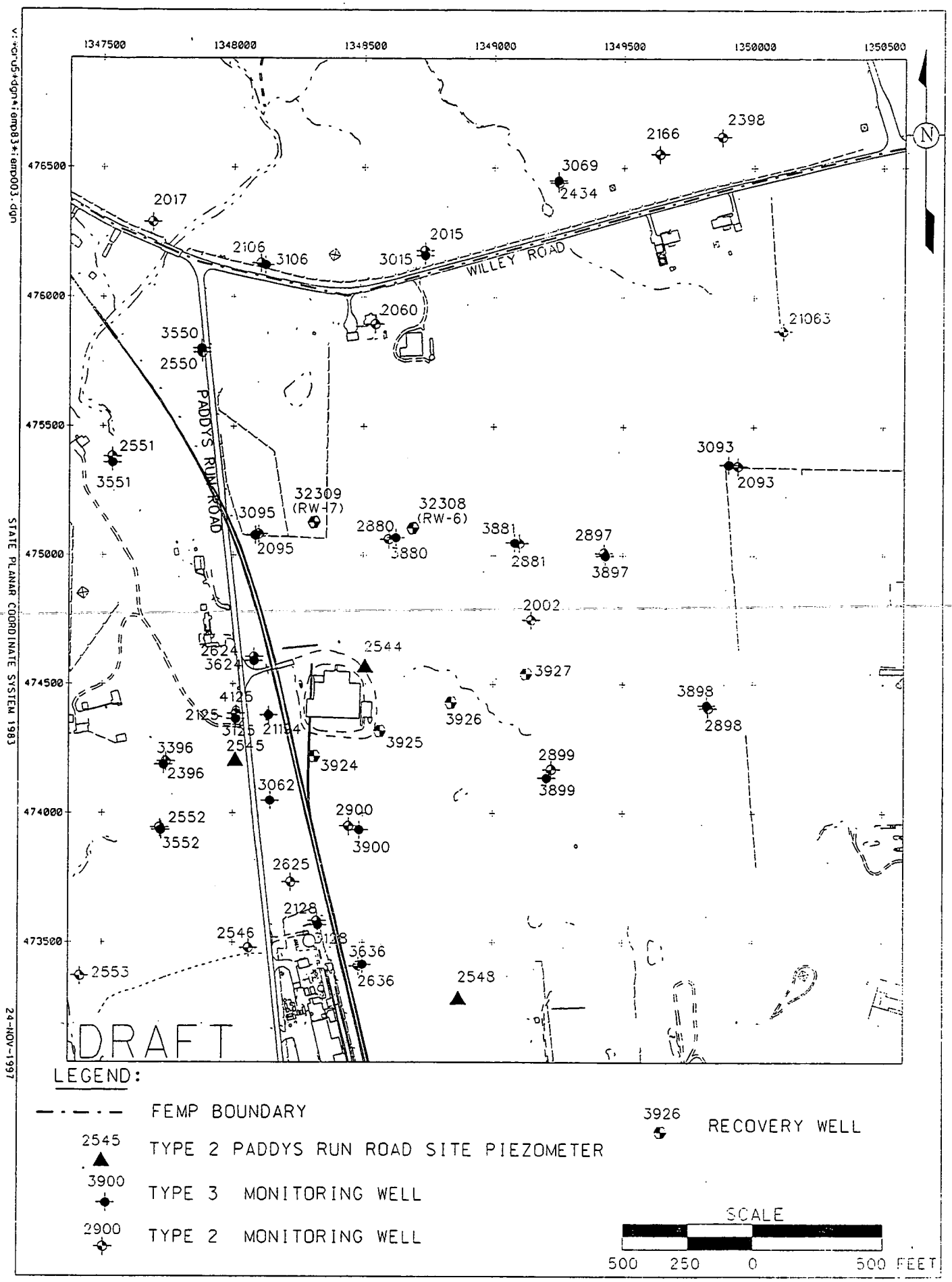


FIGURE 1-3. SOUTH PLUME MONITORING WELLS AND RECOVERY WELLS

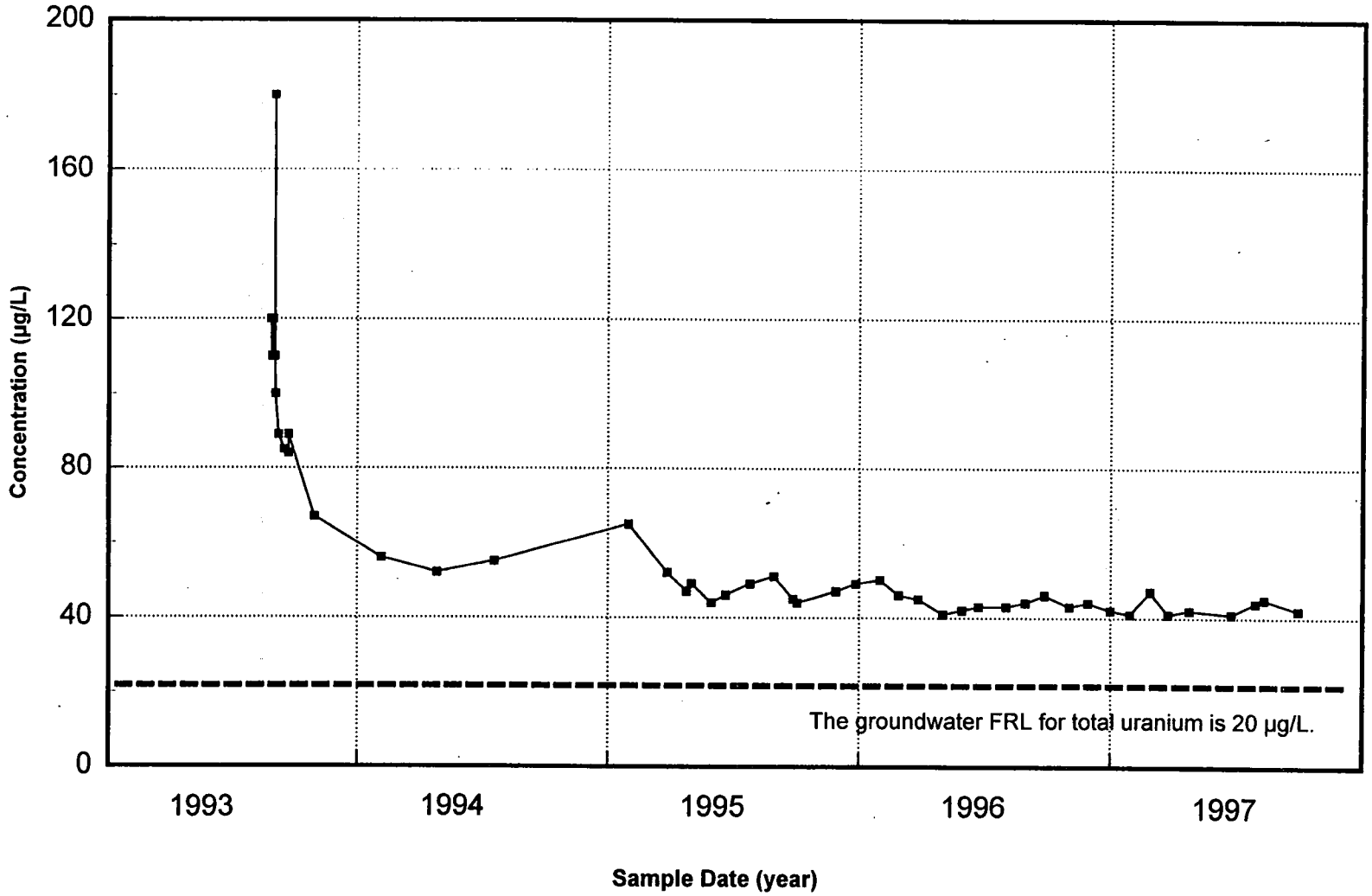


FIGURE 1-4. RECOVERY WELL 3924 (RW-1) TOTAL URANIUM CONCENTRATIONS

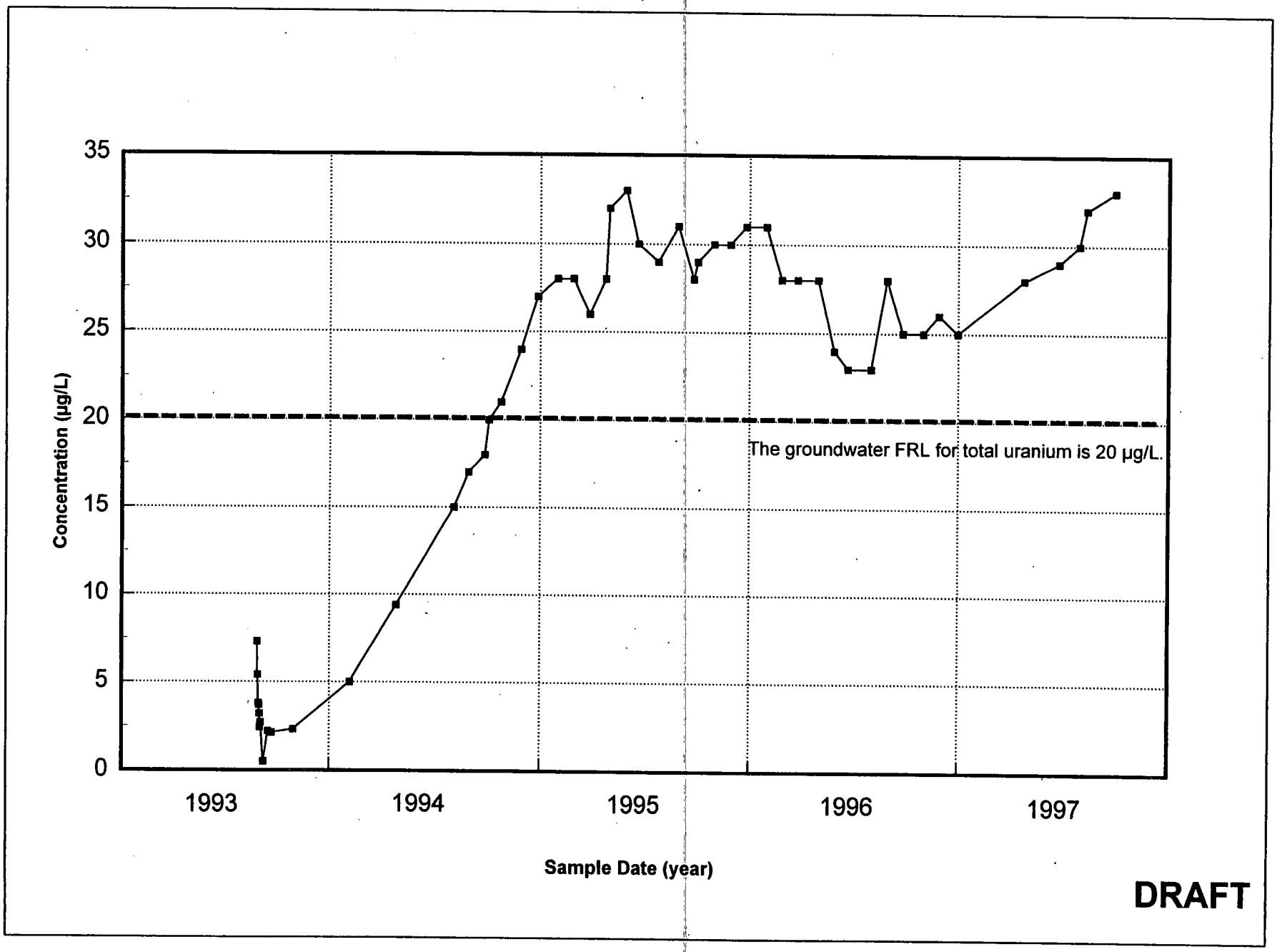


FIGURE 1-5. RECOVERY WELL 3925 (RW-2) TOTAL URANIUM CONCENTRATIONS

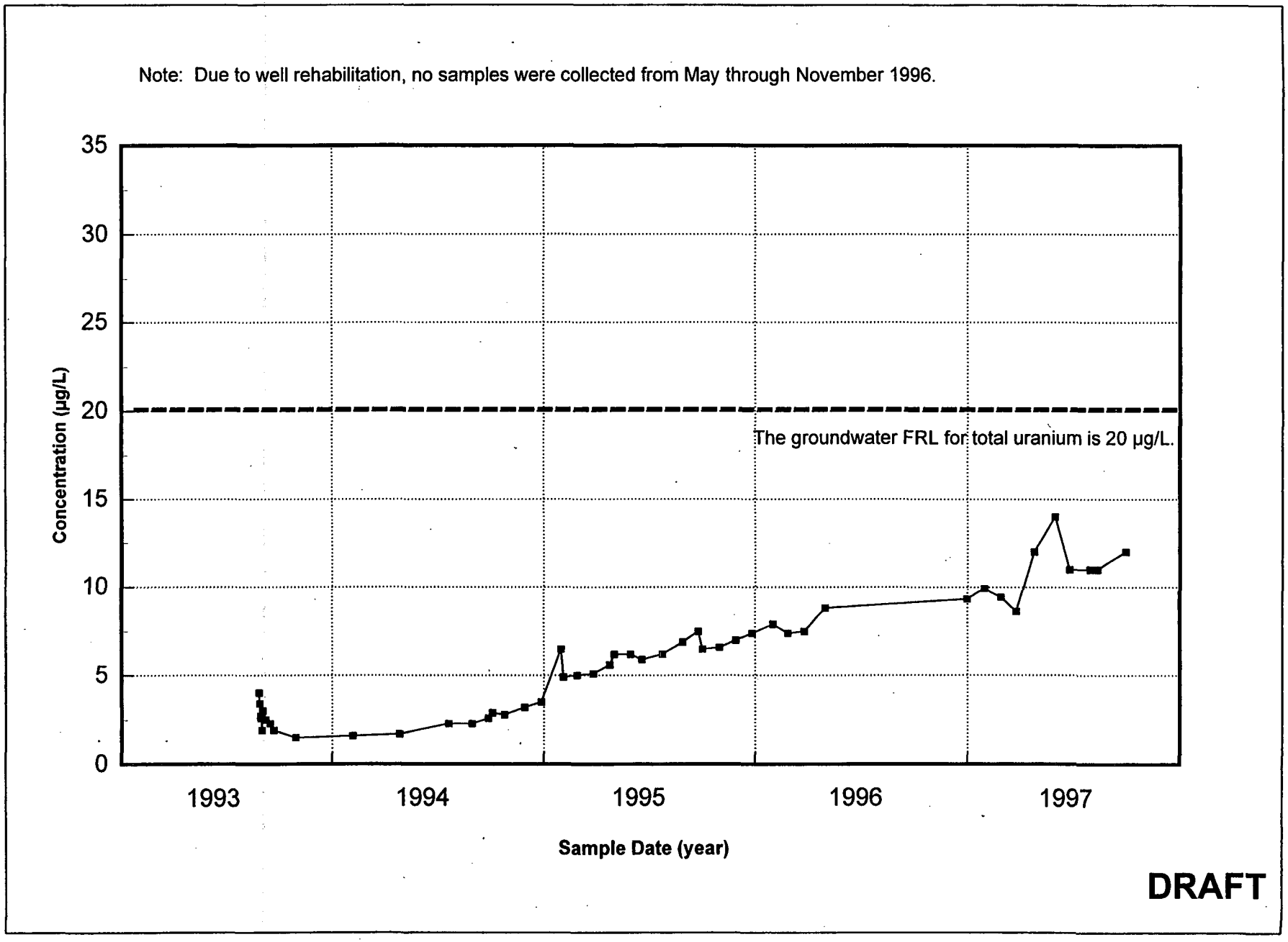


FIGURE 1-6. RECOVERY WELL 3926 (RW-3) TOTAL URANIUM CONCENTRATIONS

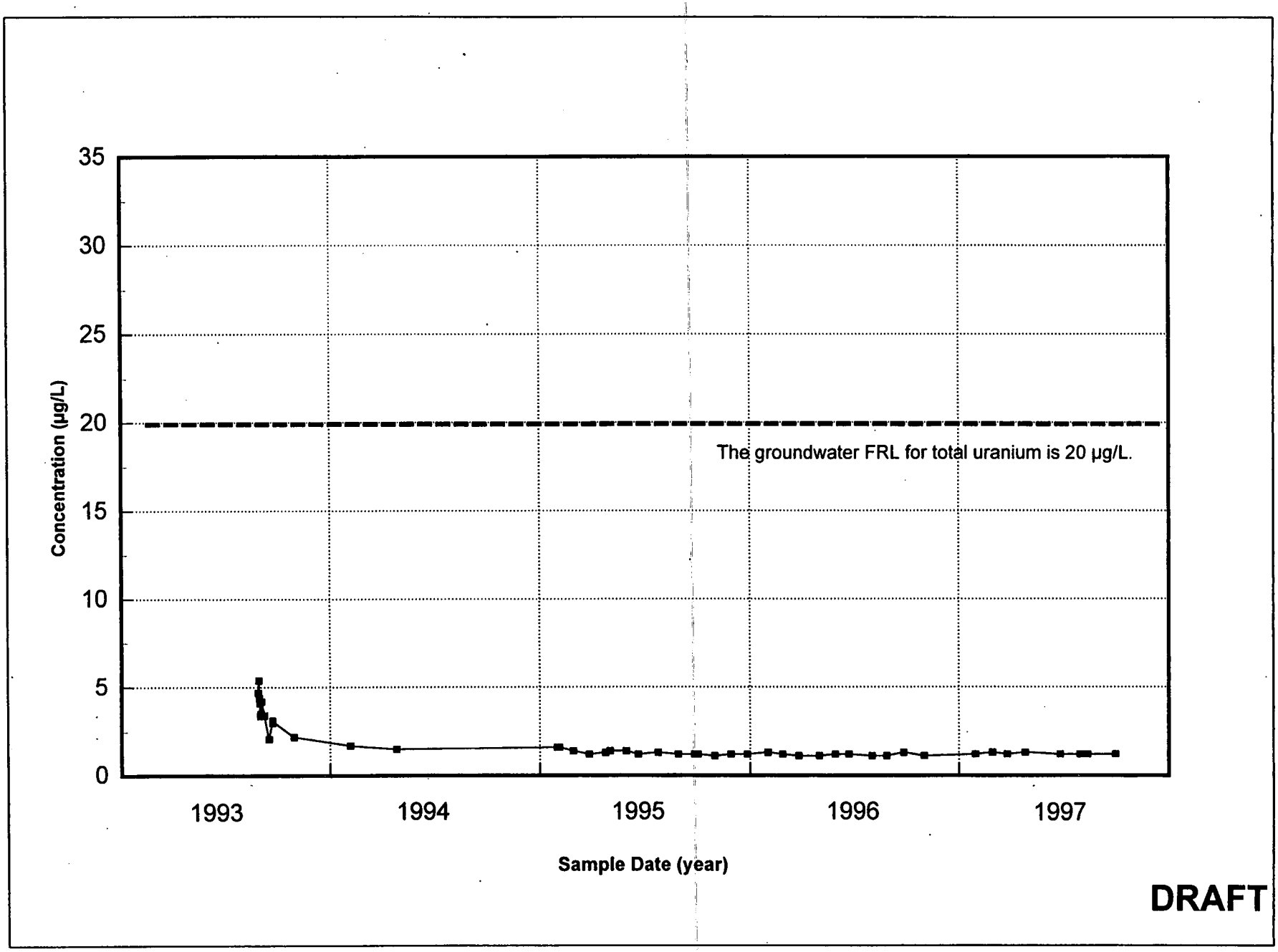


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FIGURE 1-7. RECOVERY WELL 3927 (RW-4) TOTAL URANIUM CONCENTRATIONS

Note: Flow-weighted samples are collected daily at the Storm Water Retention Basin Valve House from the South Plume discharge water.

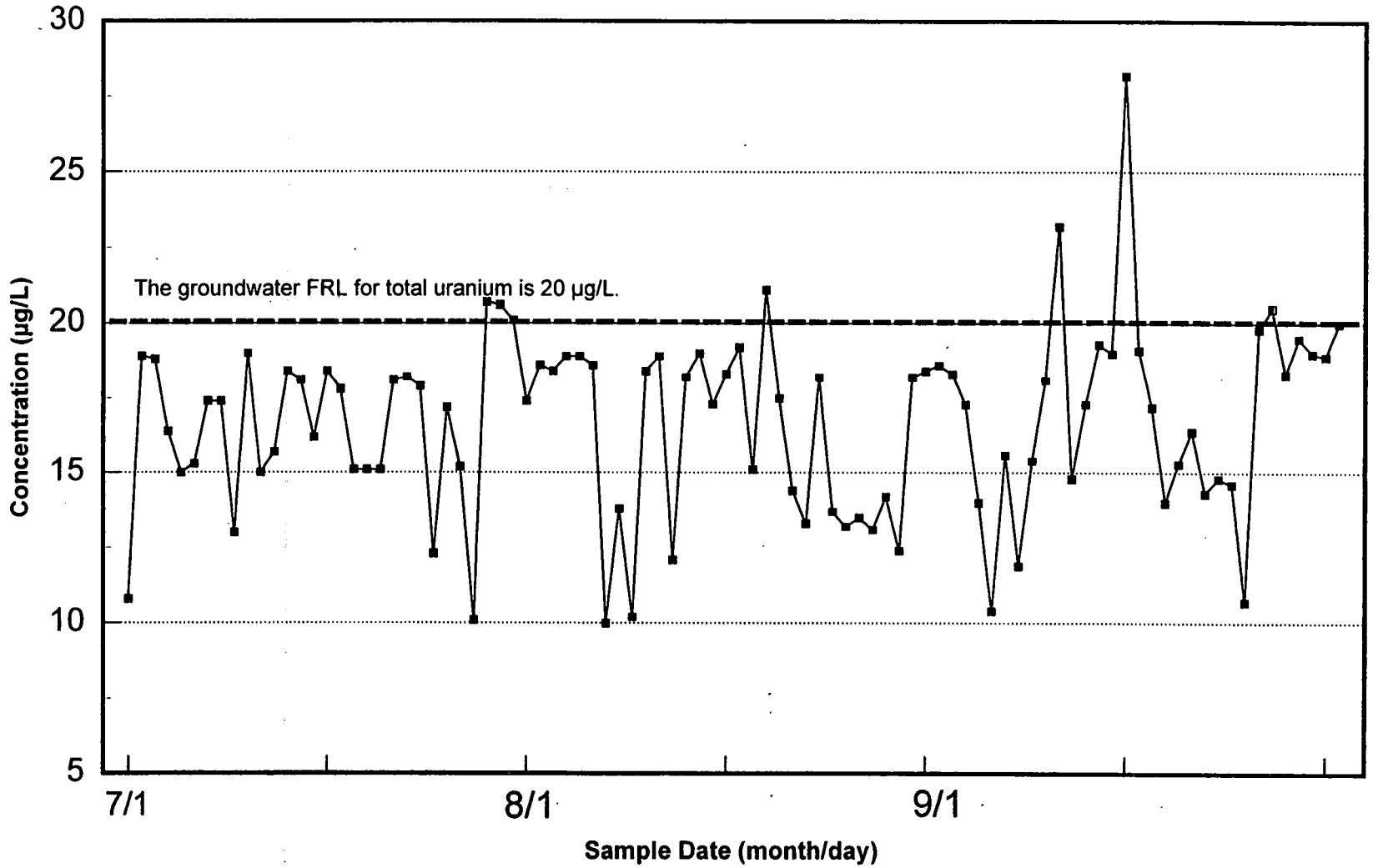

FIGURE 1-8. DAILY TOTAL URANIUM CONCENTRATIONS FROM SOUTH PLUME DISCHARGE WATER, 7/97 - 9/97

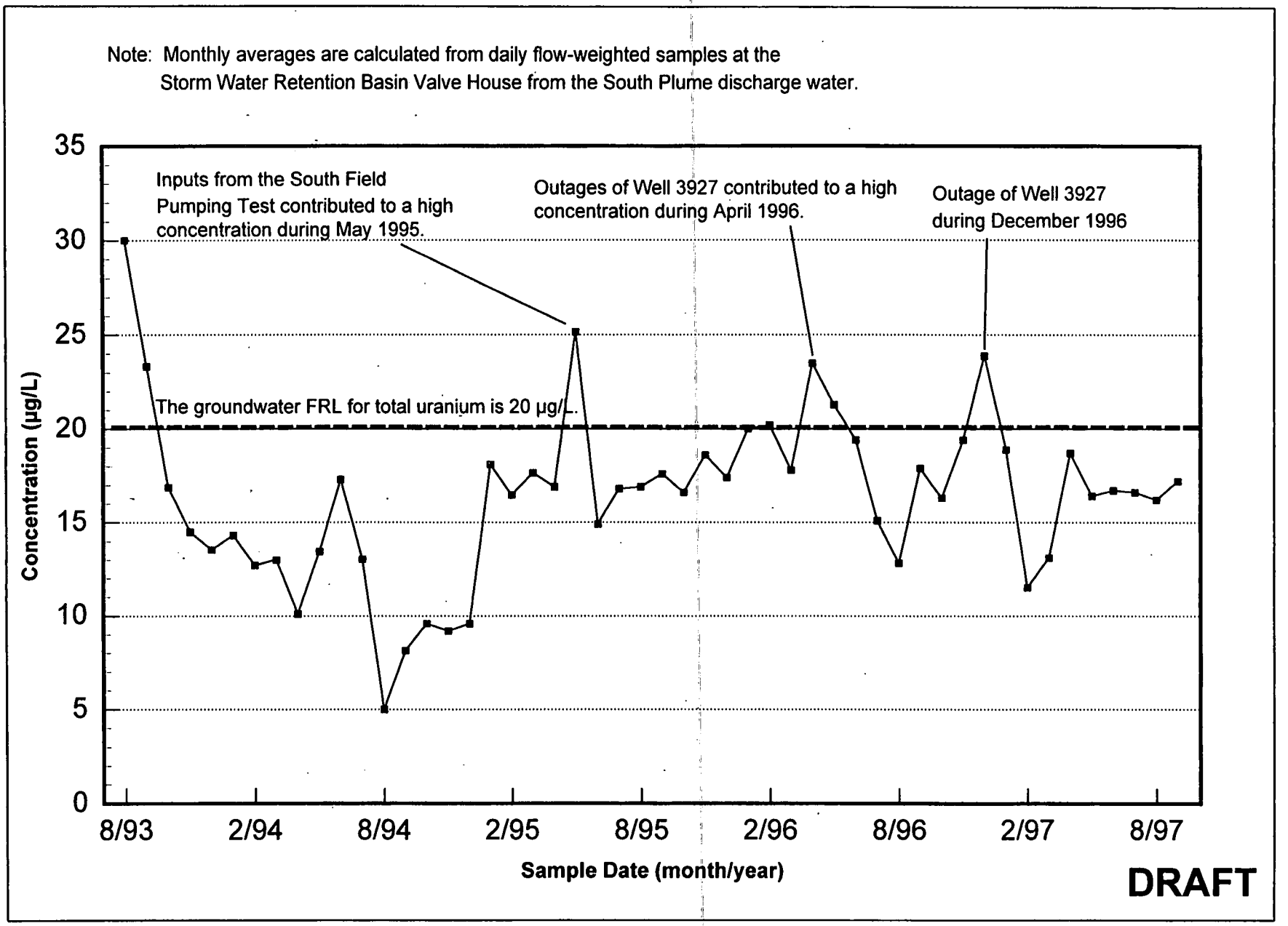

FIGURE 1-9. MONTHLY AVERAGE TOTAL URANIUM CONCENTRATIONS FROM SOUTH PLUME DISCHARGE WATER, 8/93 - 9/97

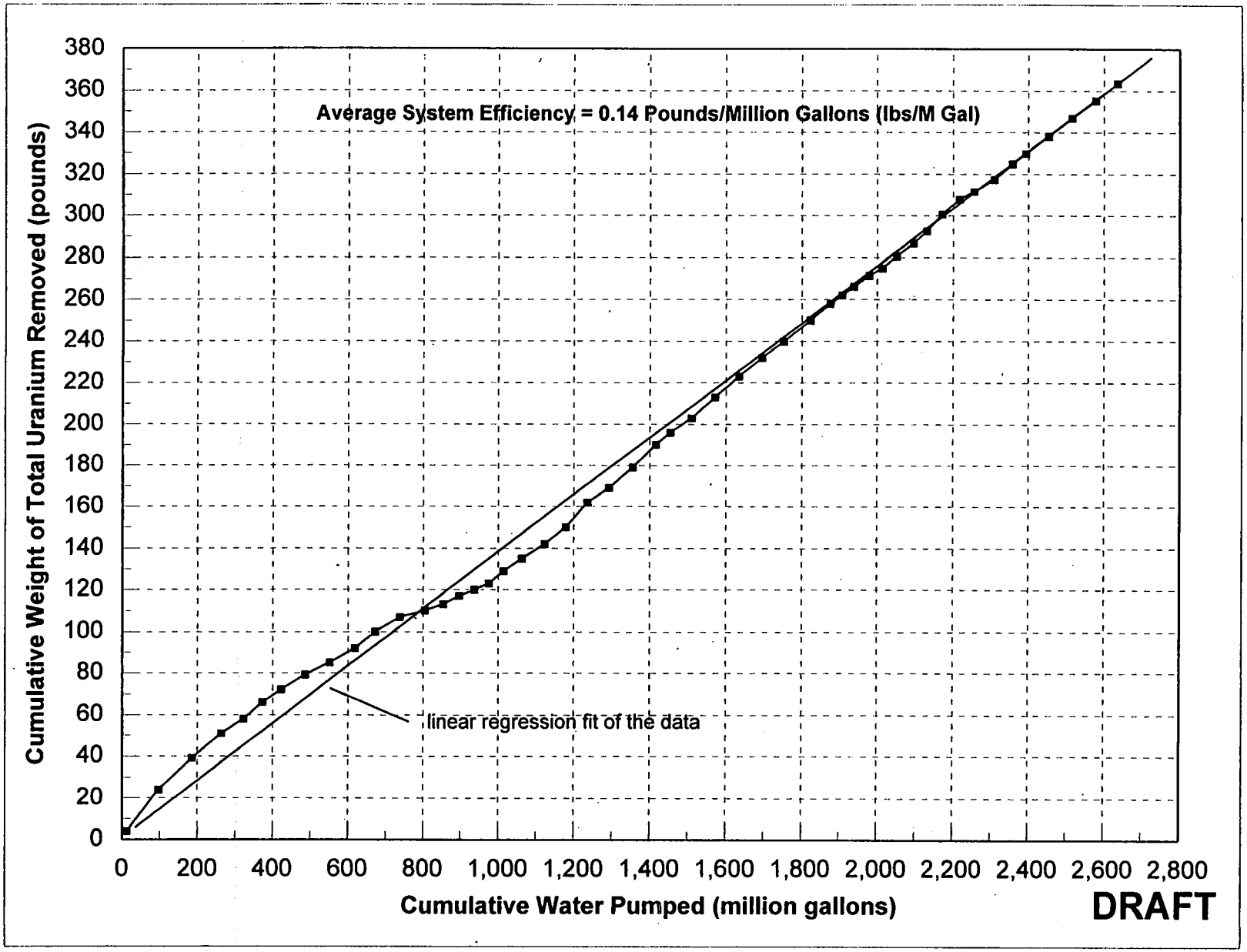

FIGURE 1-10. CUMULATIVE TOTAL URANIUM REMOVED VERSUS CUMULATIVE WATER PUMPED FROM SOUTH PLUME WELLFIELD, 8/93 - 9/97

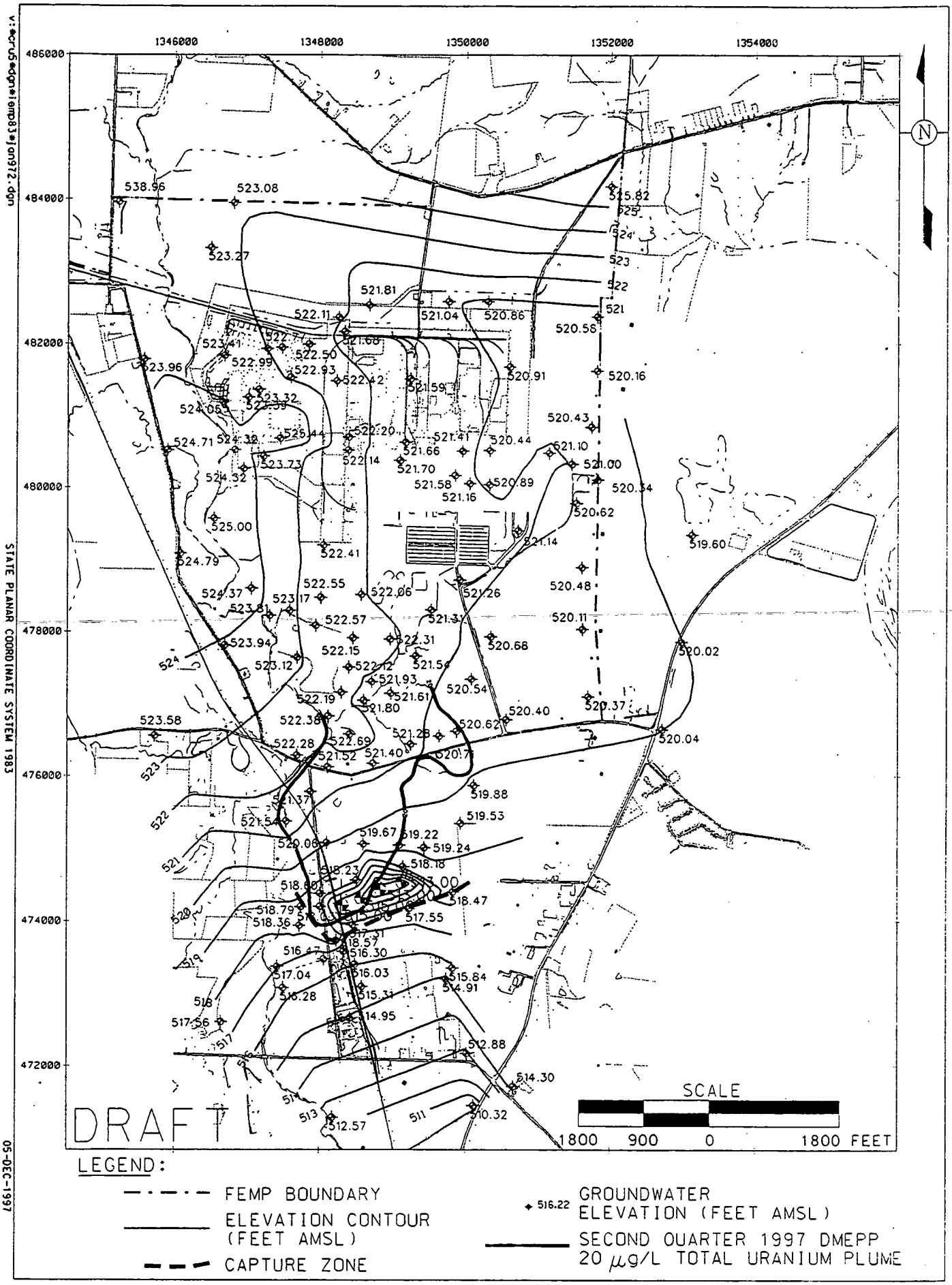

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FIGURE 1-11. GROUNDWATER ELEVATIONS, TYPE 2 WELLS, JANUARY 1997

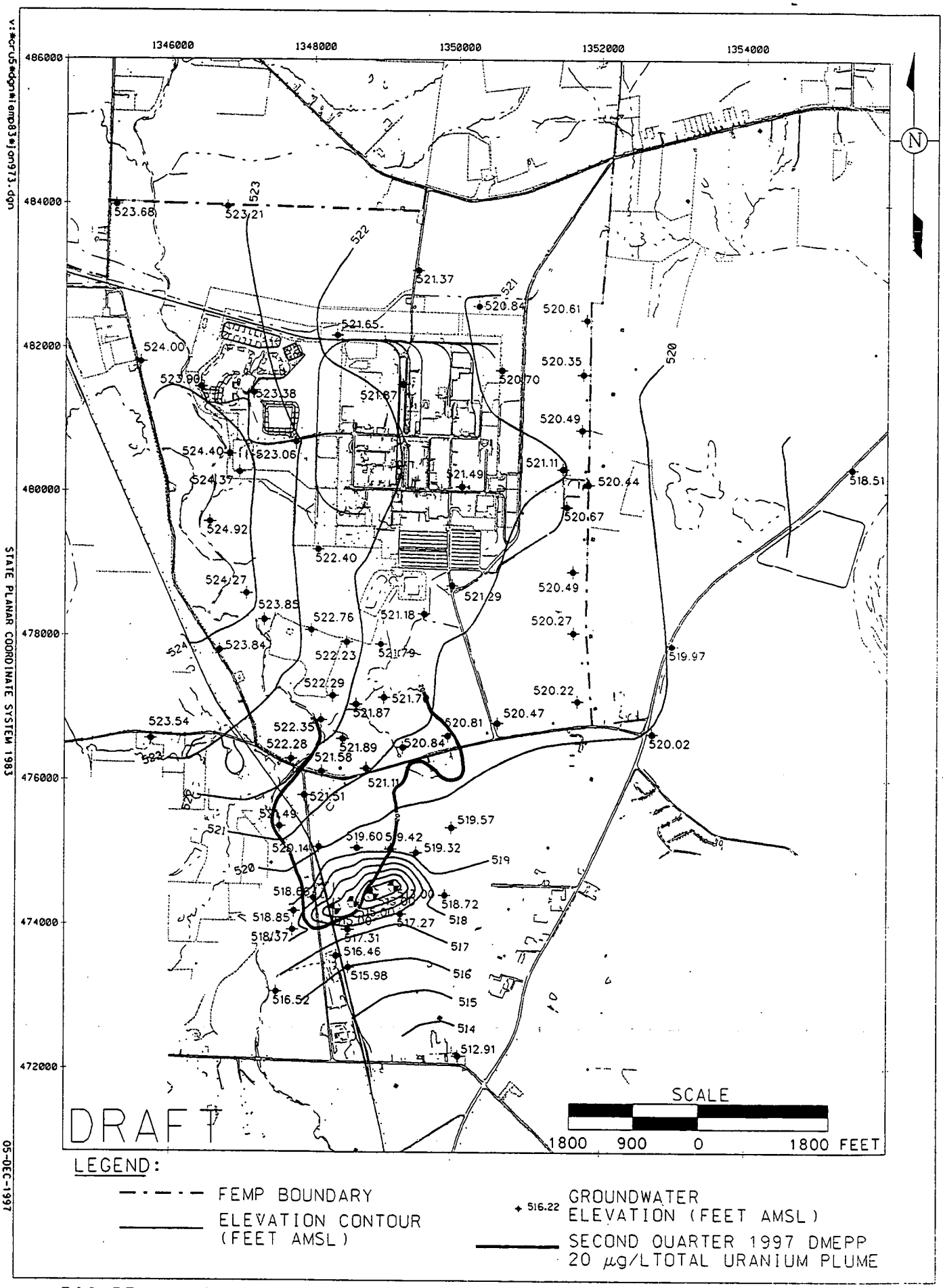


FIGURE 1-12. GROUNDWATER ELEVATIONS, TYPE 3 WELLS, JANUARY 1997

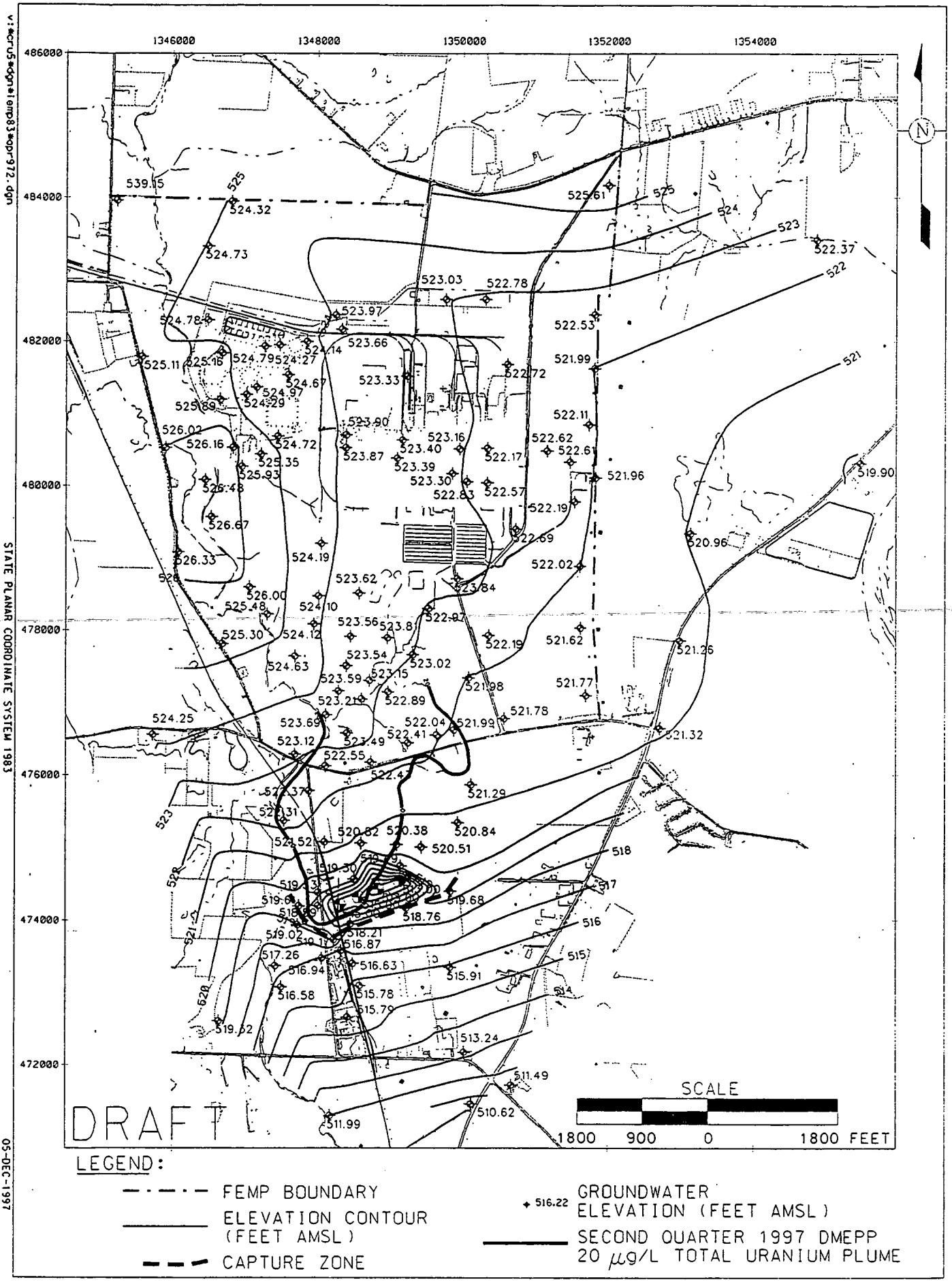


FIGURE 1-13. GROUNDWATER ELEVATIONS, TYPE 2 WELLS, APRIL 1997

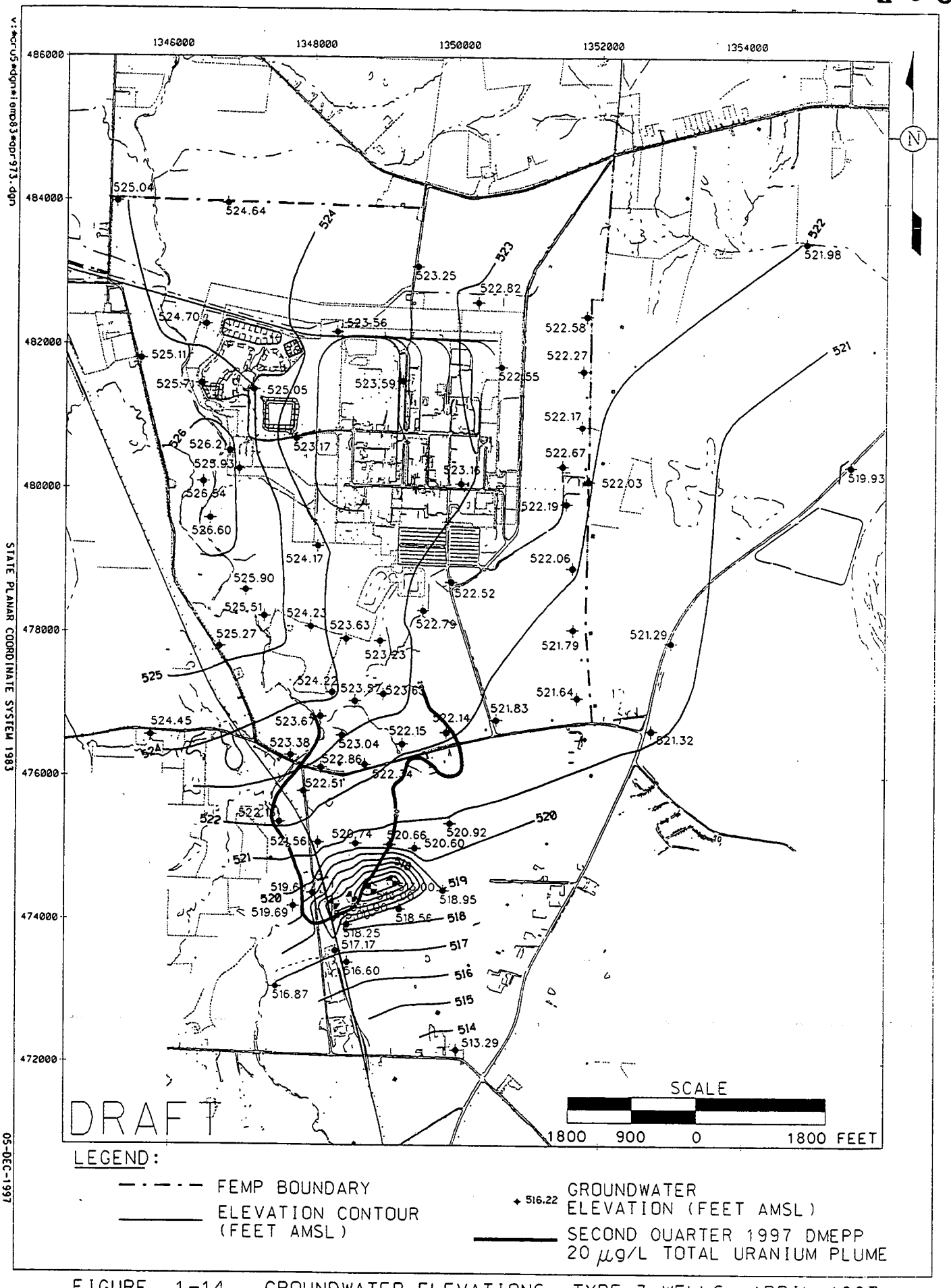


FIGURE 1-14. GROUNDWATER ELEVATIONS, TYPE 3 WELLS, APRIL 1997

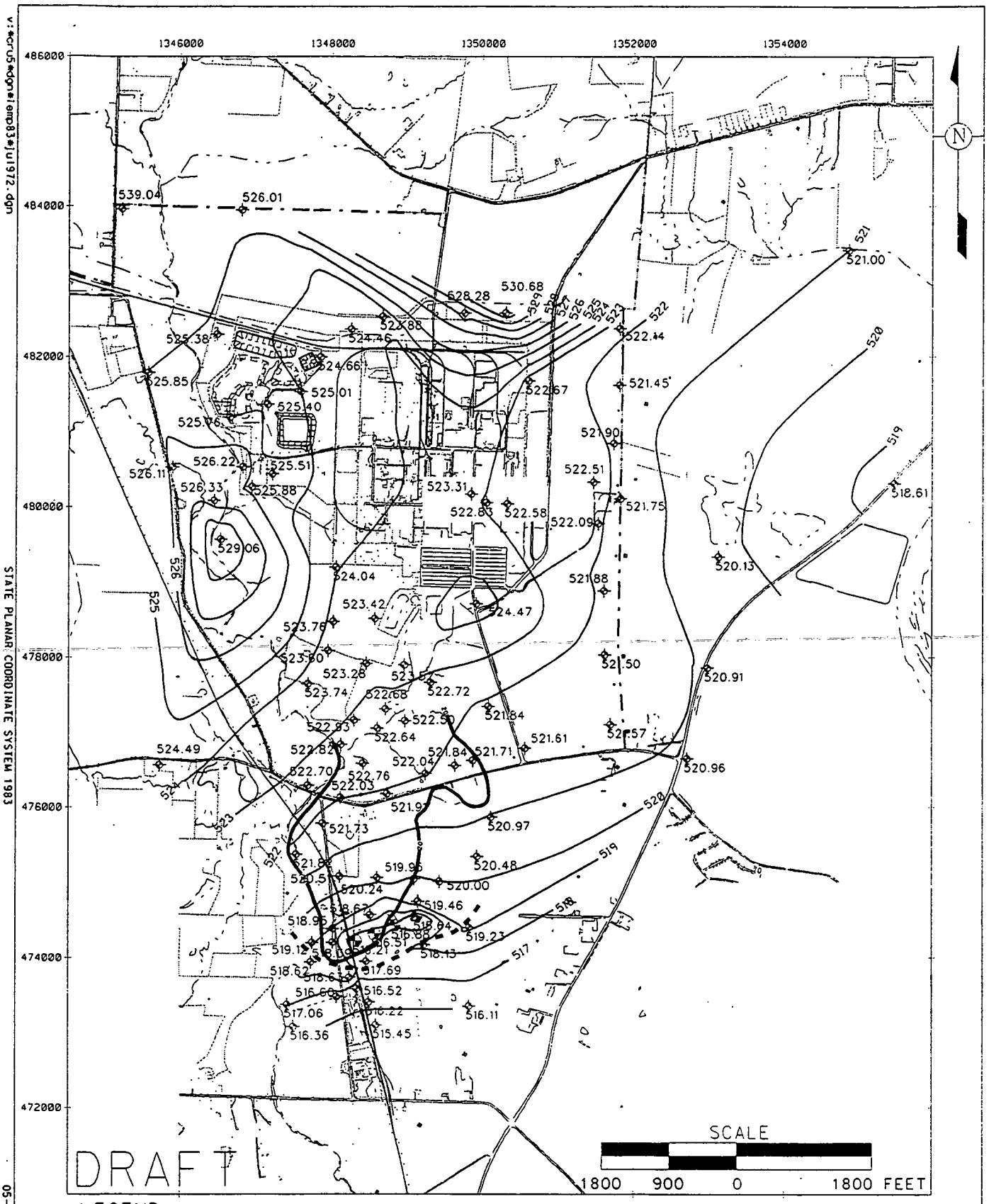


FIGURE 1-15. GROUNDWATER ELEVATIONS, TYPE 2 WELLS, JULY 1997

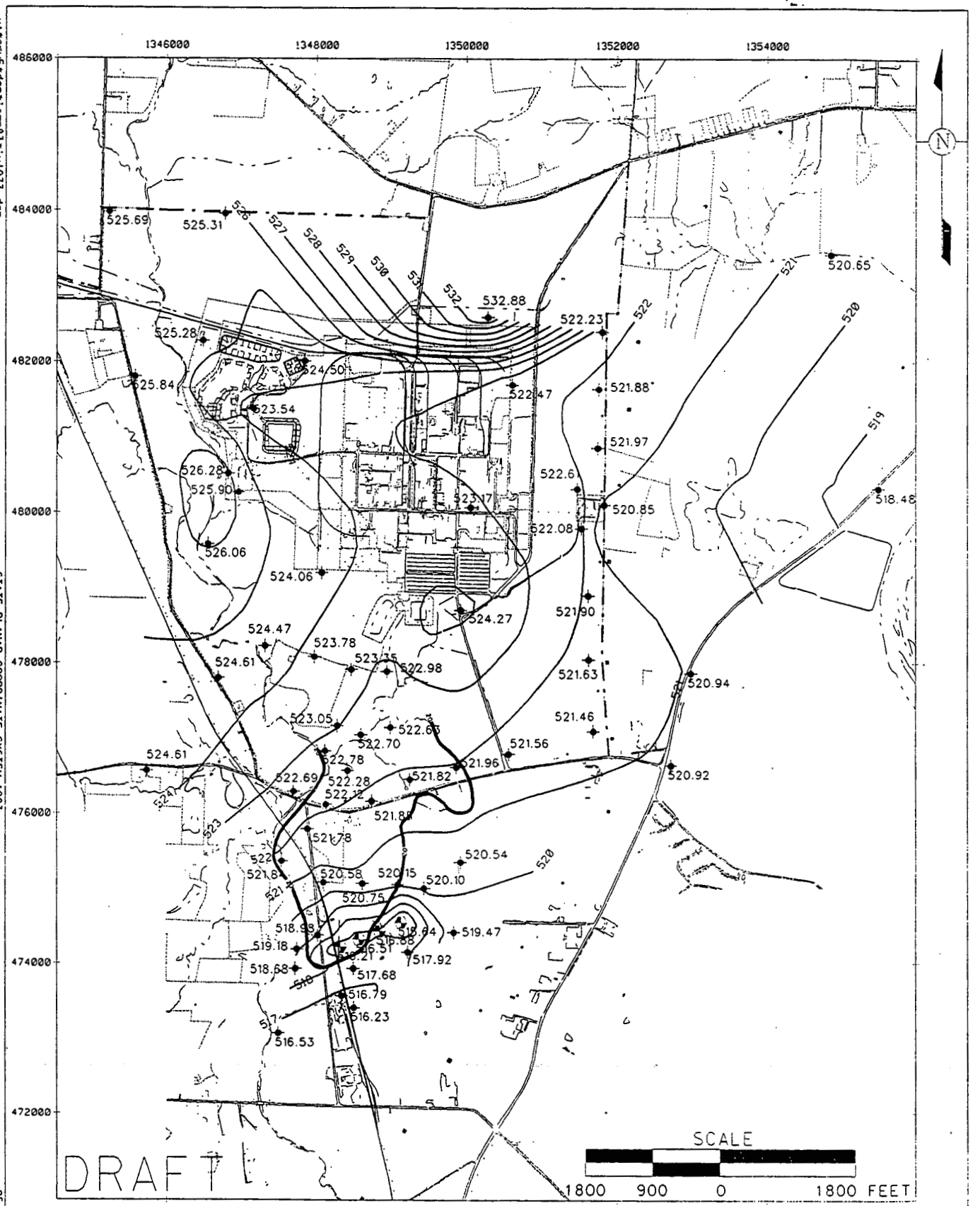


FIGURE 1-16. GROUNDWATER ELEVATIONS, TYPE 3 WELLS, JULY 1997

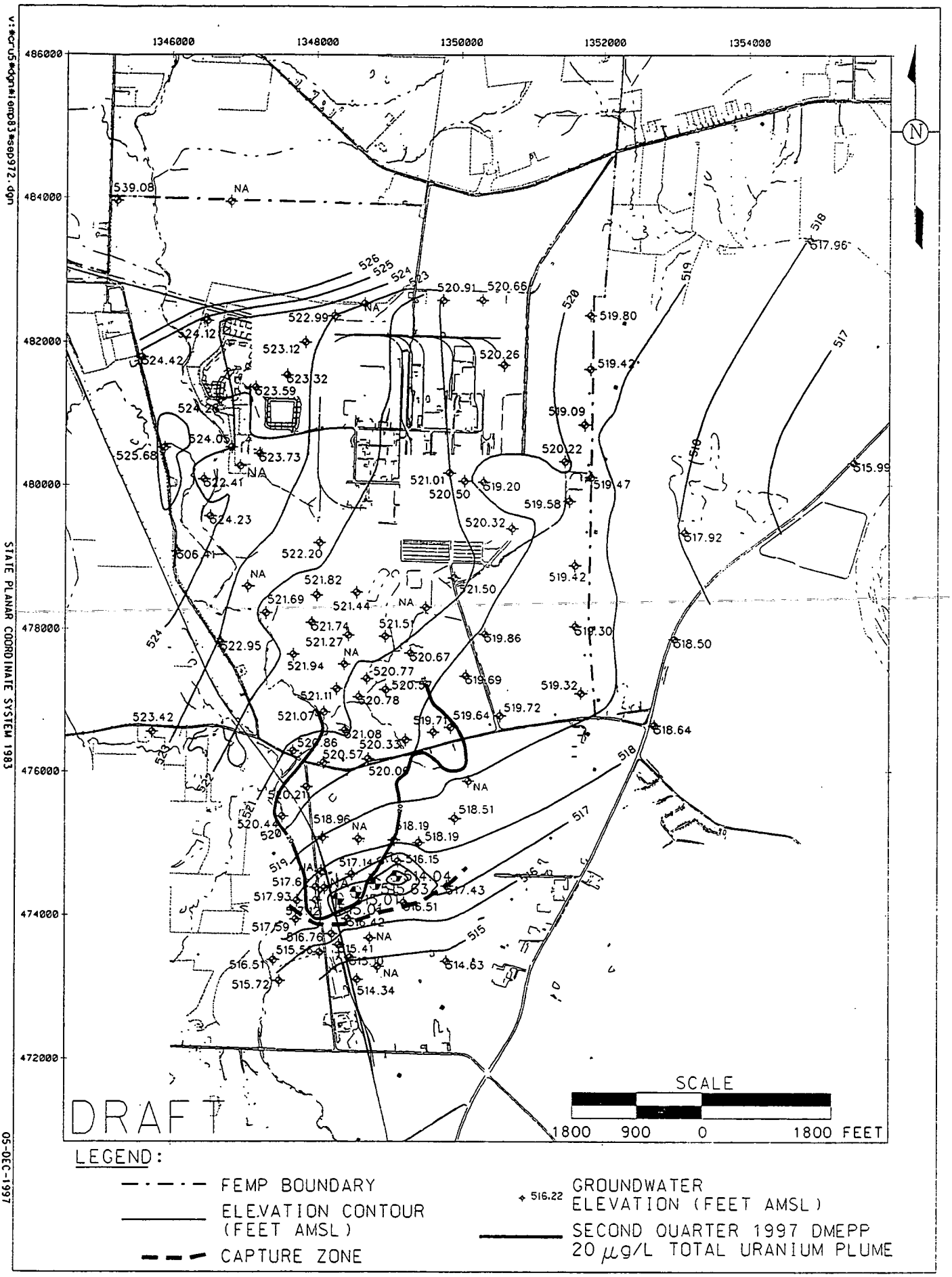
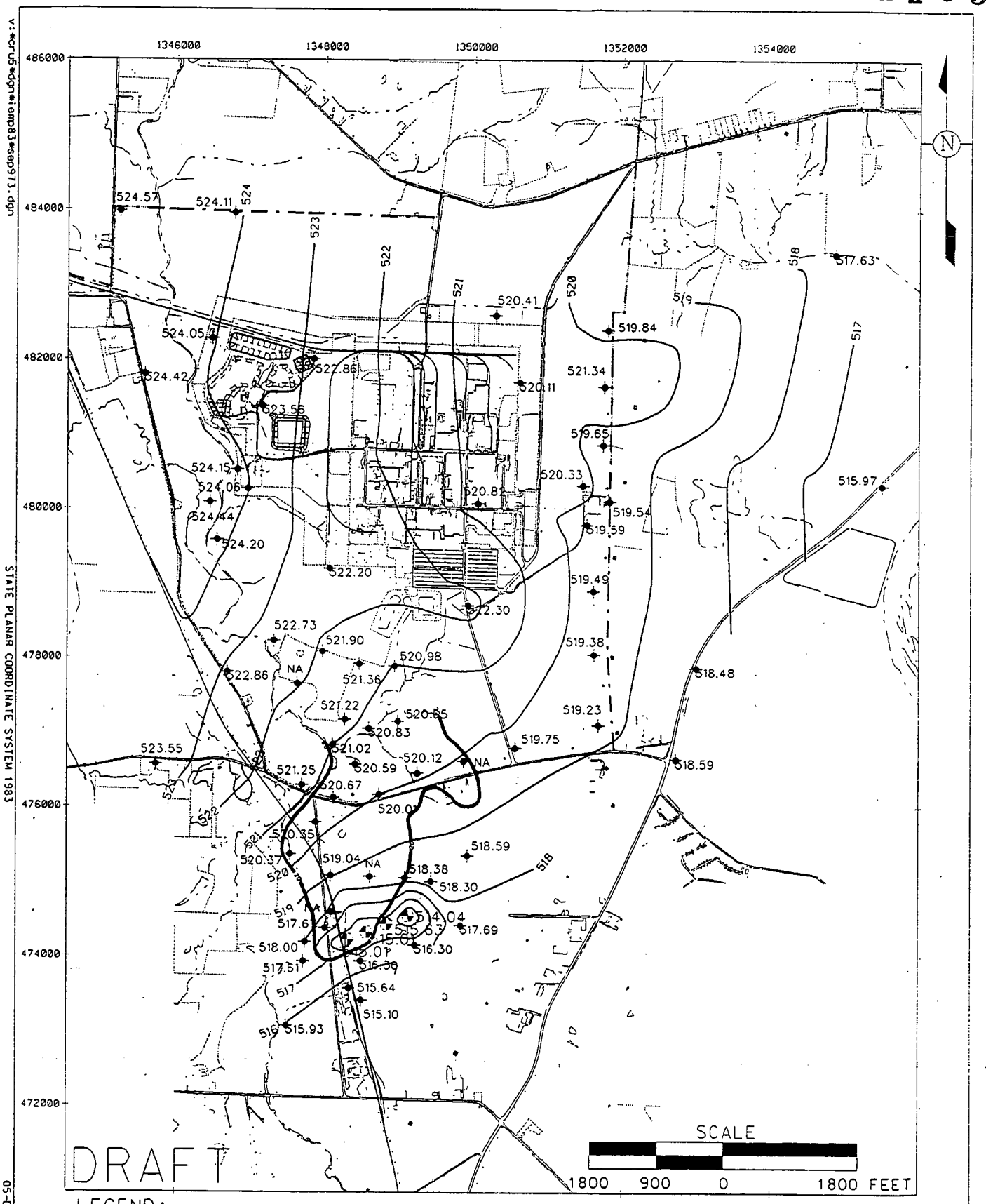


FIGURE 1-17. GROUNDWATER ELEVATIONS, TYPE 2 WELLS, SEPTEMBER 1997



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STATE PLANAR COORDINATE SYSTEM 1983

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FIGURE 1-18. GROUNDWATER ELEVATIONS, TYPE 3 WELLS, SEPTEMBER 1997

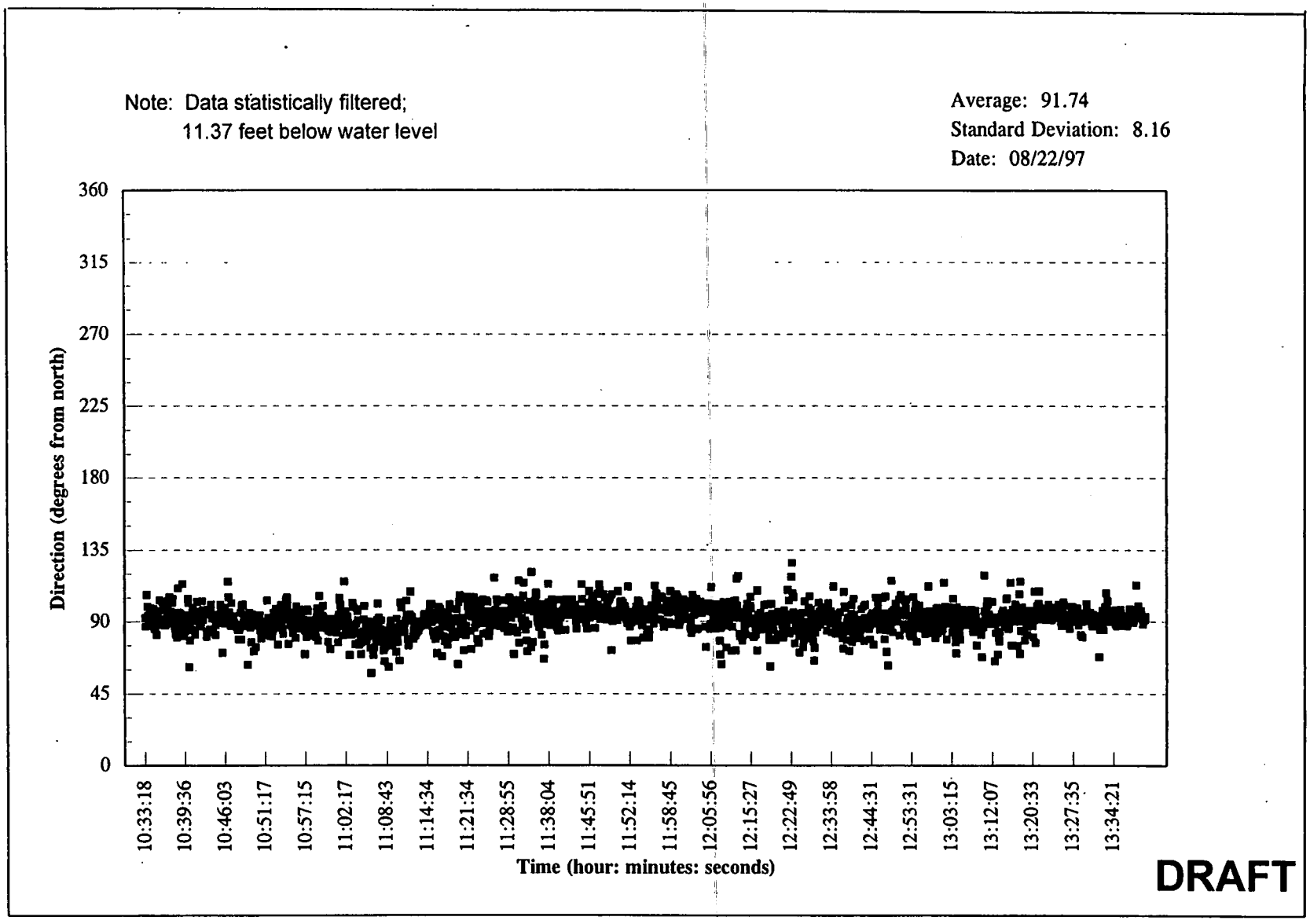


FIGURE 1-19. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 2552 USING COLLOIDAL BORESCOPE

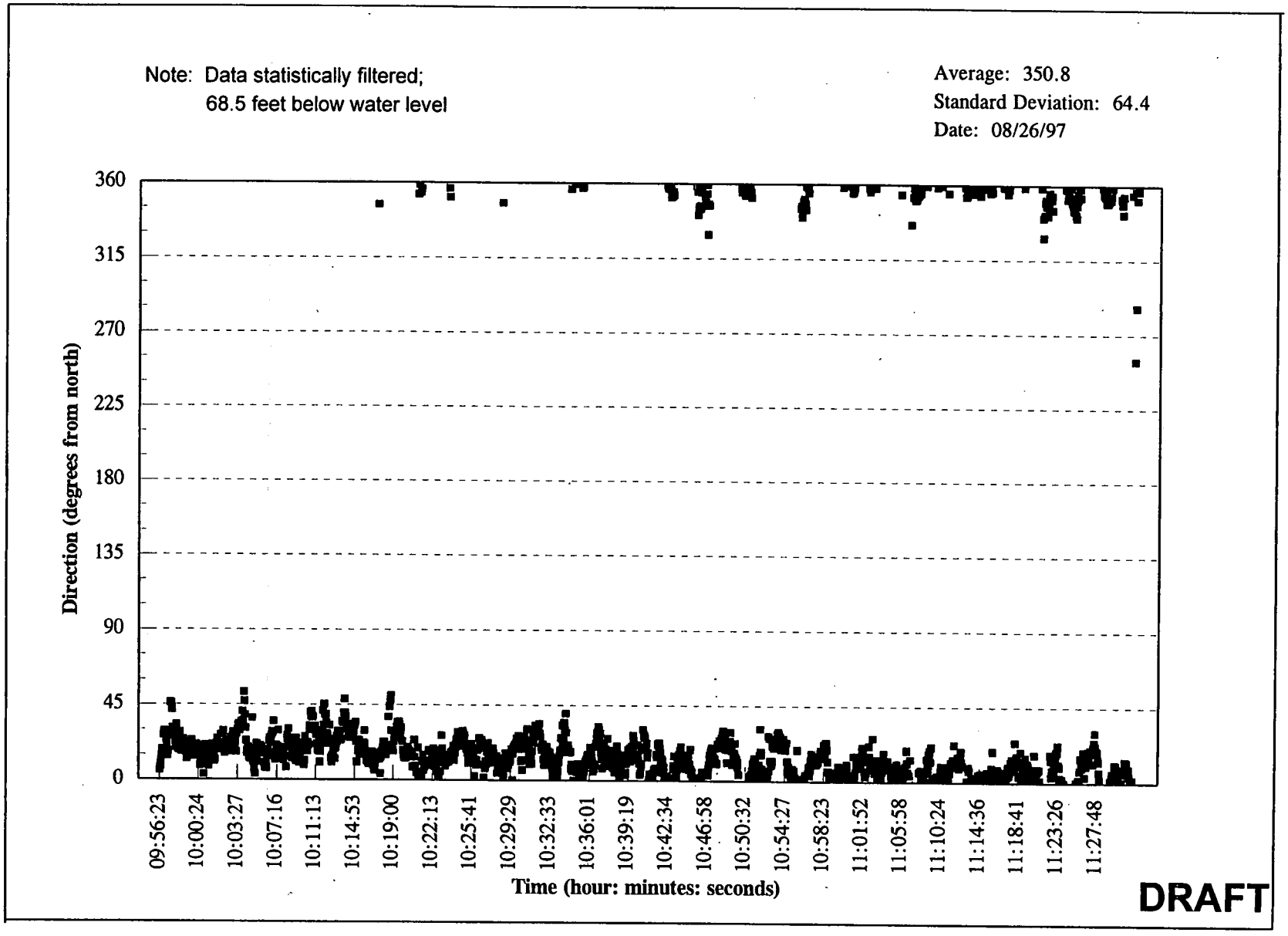


FIGURE 1-20. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 3552 USING COLOIDAL BORESCOPE

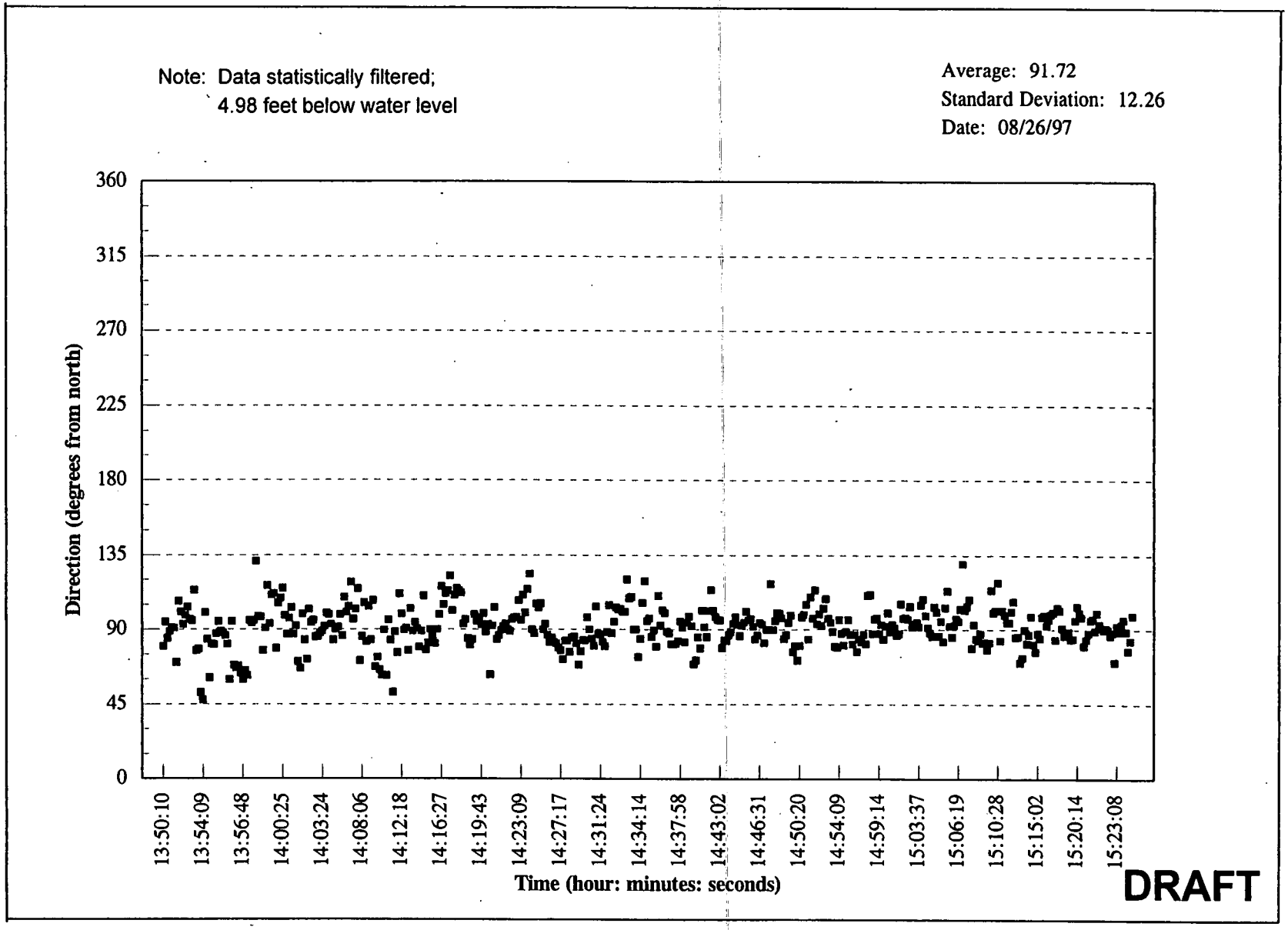


FIGURE 1-21. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 2898 USING COLLOIDAL BORESCOPE

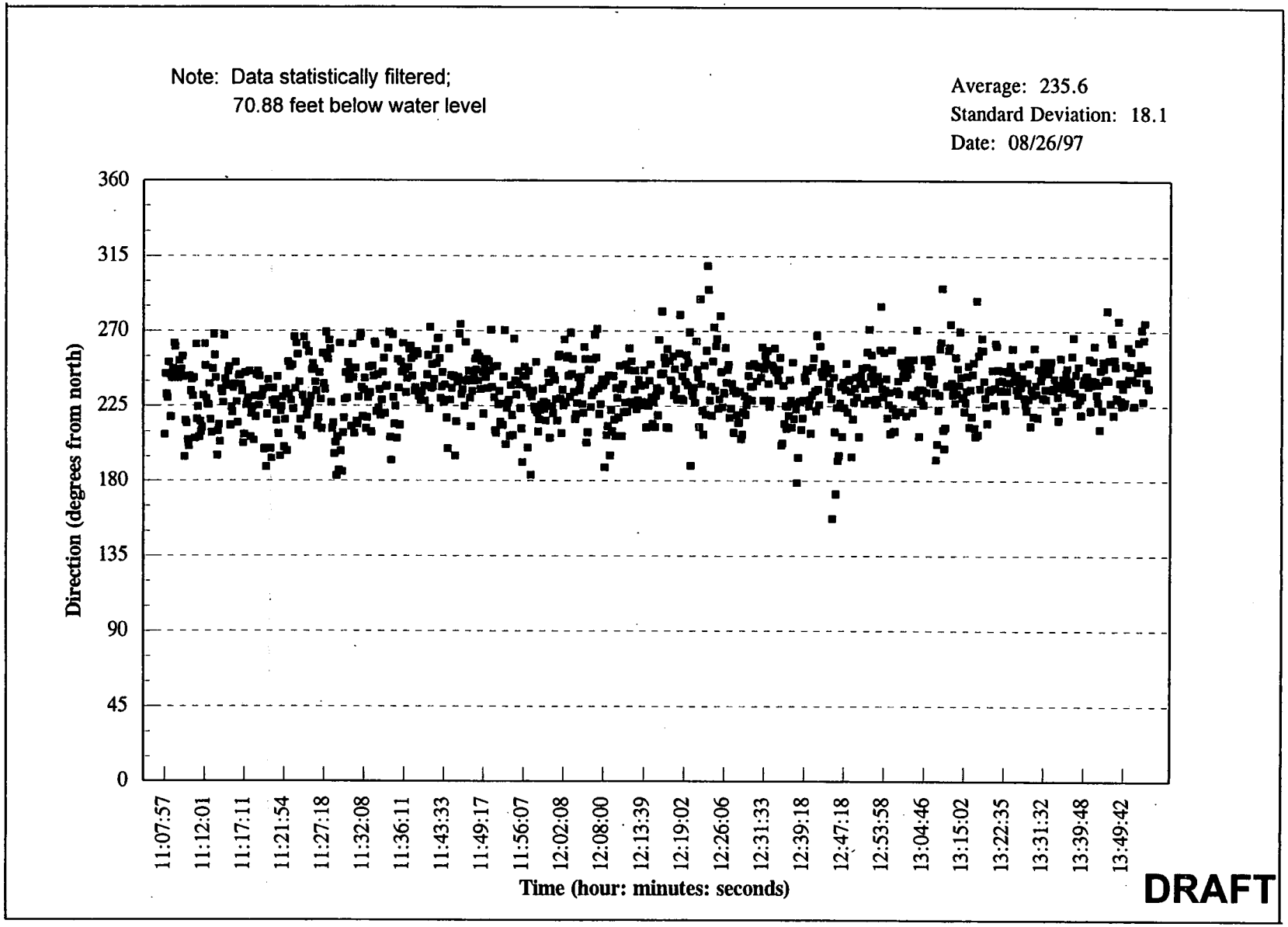


FIGURE 1-22. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 3898 USING COLLOIDAL BORESCOPE

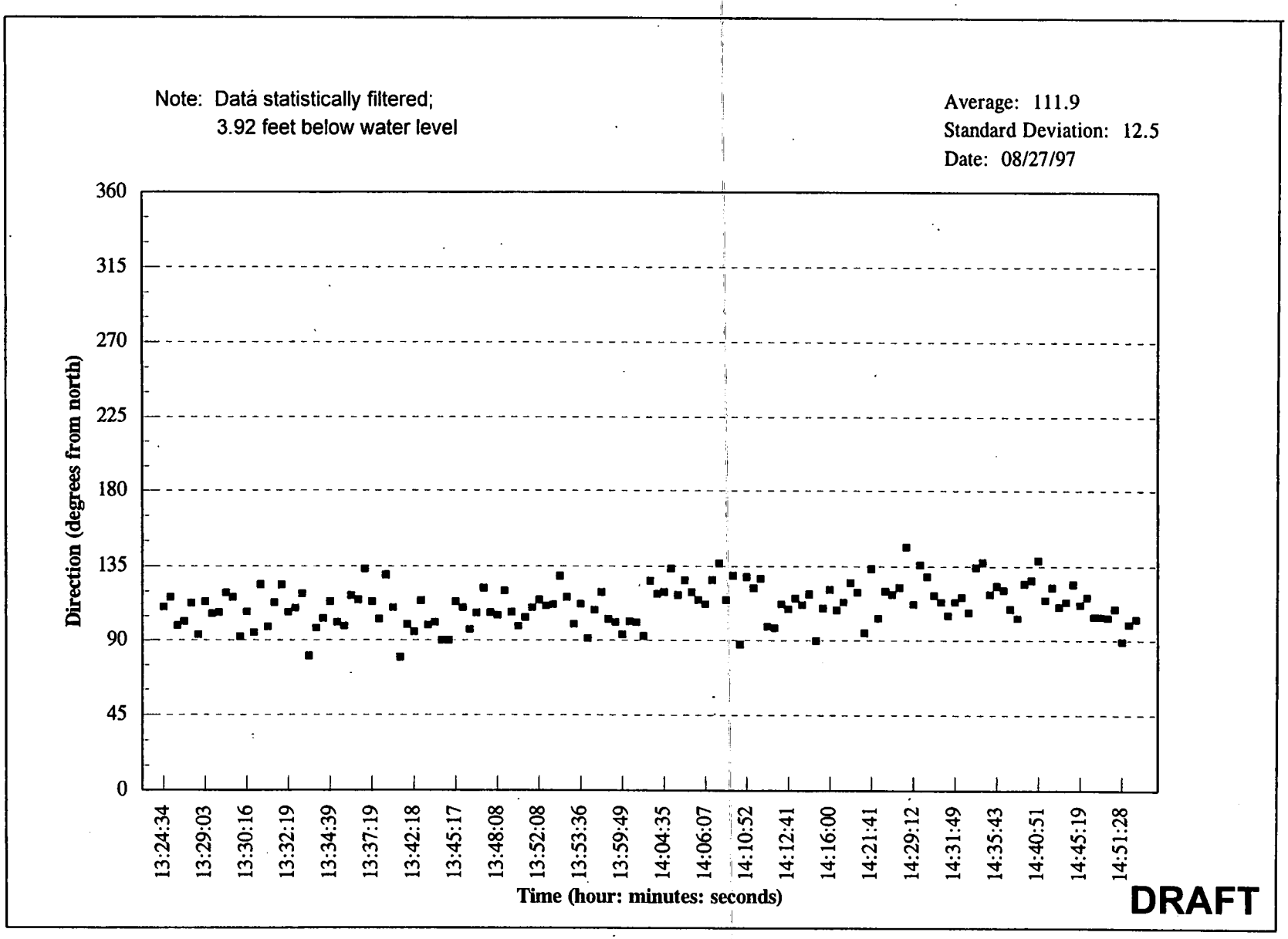


FIGURE 1-23. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 2899 USING COLLOIDAL BORESCOPE

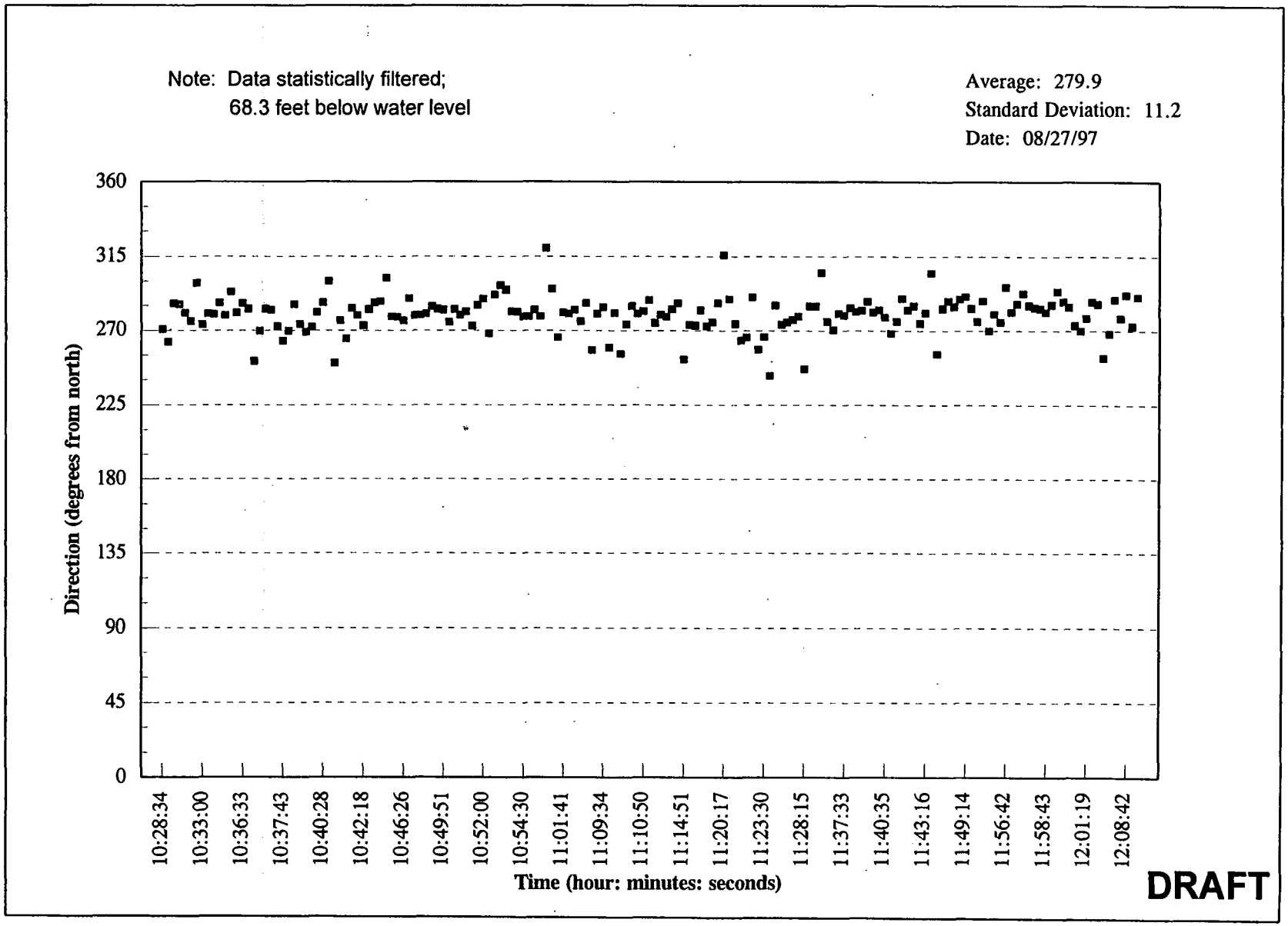


FIGURE 1-24. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 3899 USING COLLOIDAL BORESCOPE

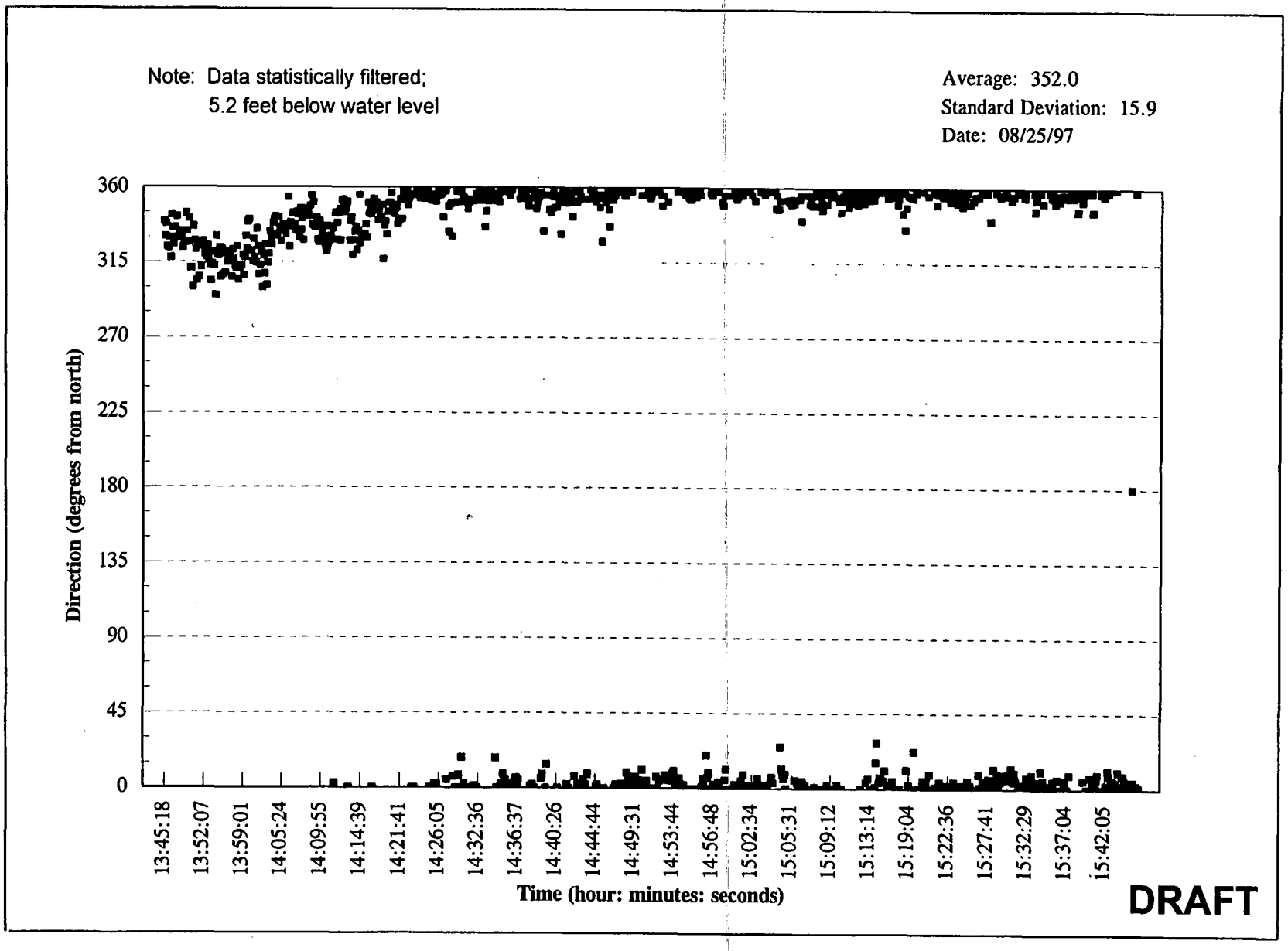


FIGURE 1-25. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 2900 USING COLLOIDAL BORESCOPE

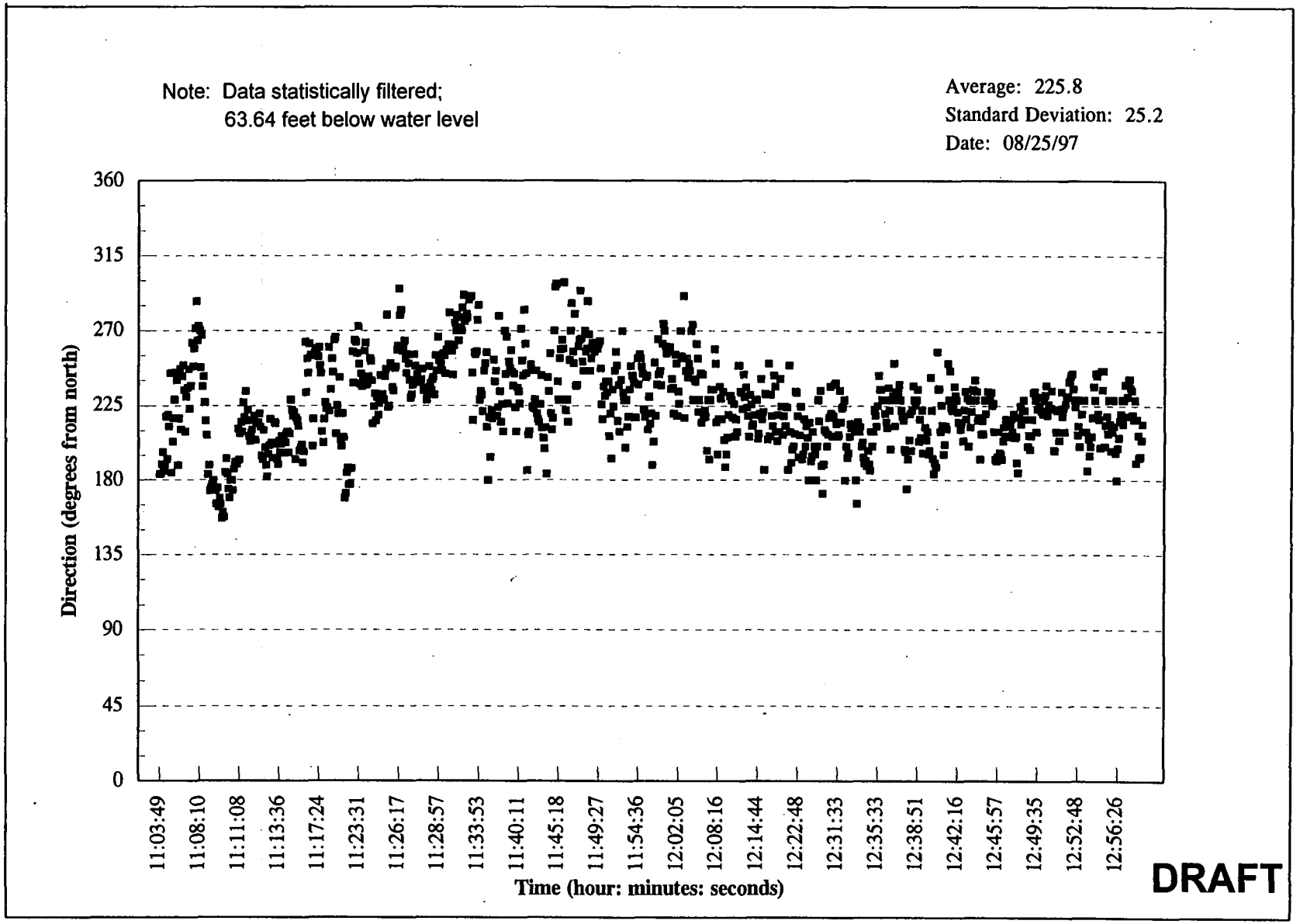


FIGURE 1-26. GROUNDWATER FLOW DIRECTION IN MONITORING WELL 3900 USING COLLOIDAL BORESCOPE

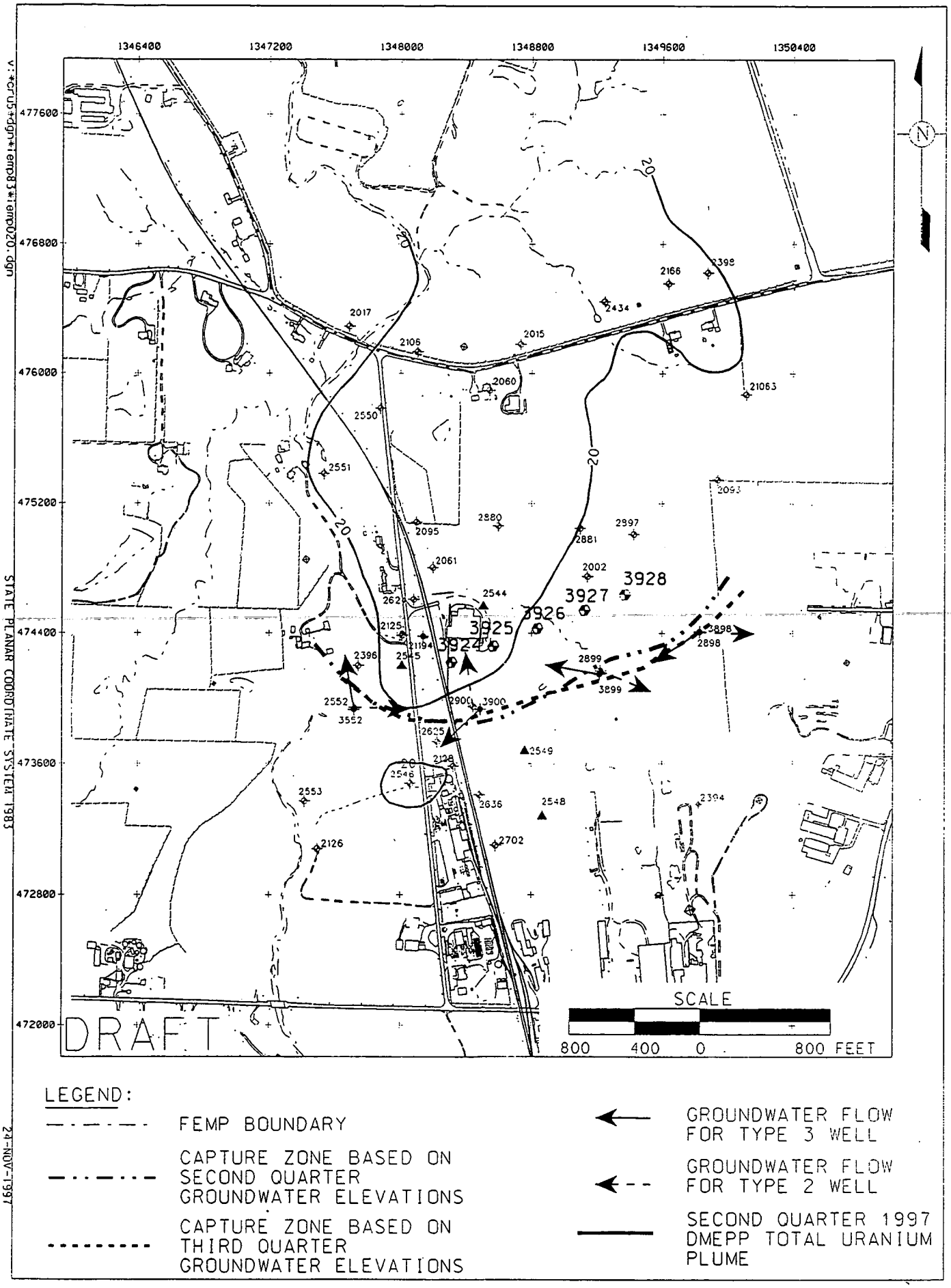


FIGURE 1-27. HYDRAULIC CAPTURE ZONES AND COLLOIDAL BORESCOPE FLOW VECTORS FOR THE SOUTH PLUME MODULE, AUGUST 1997

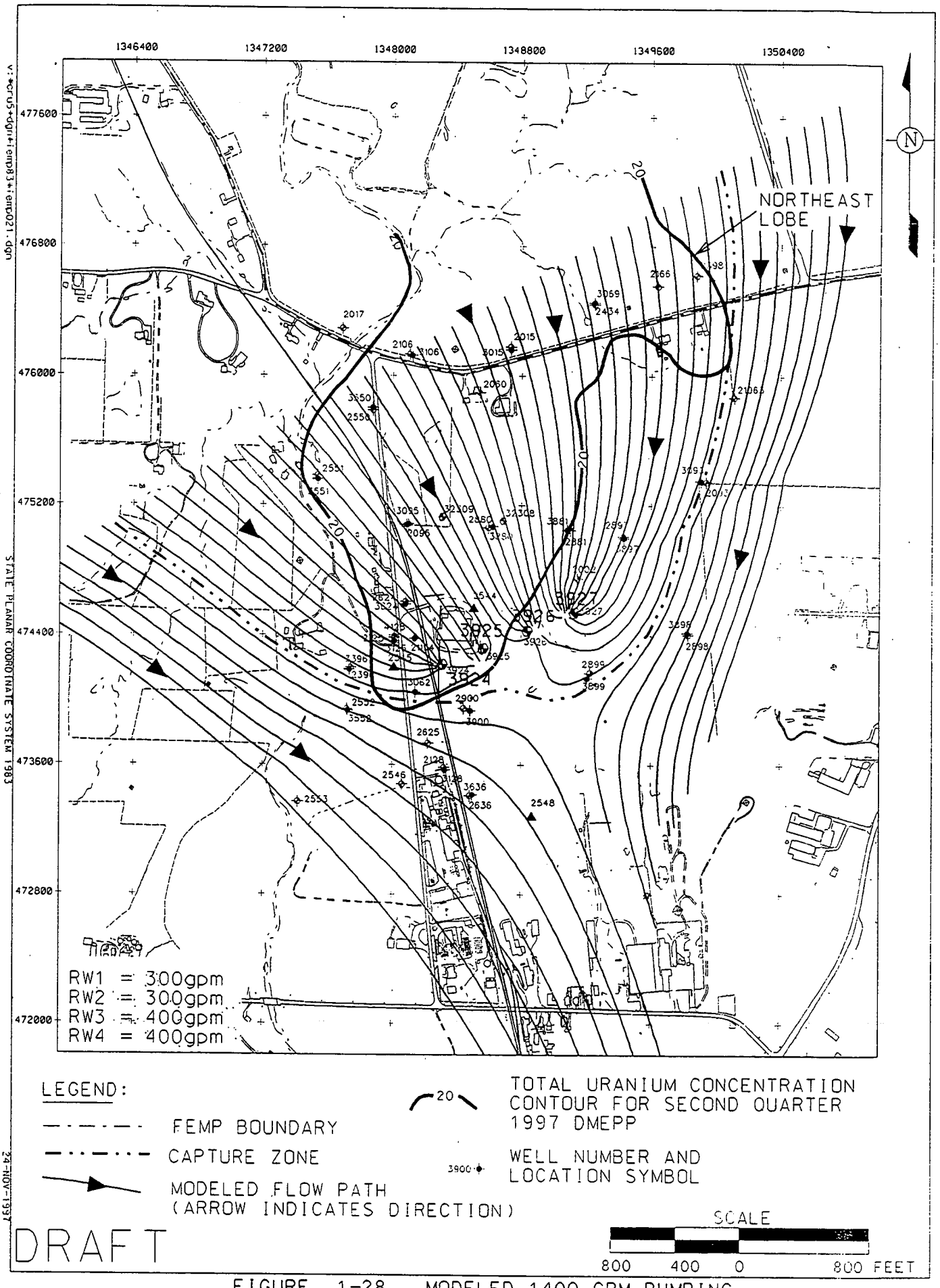
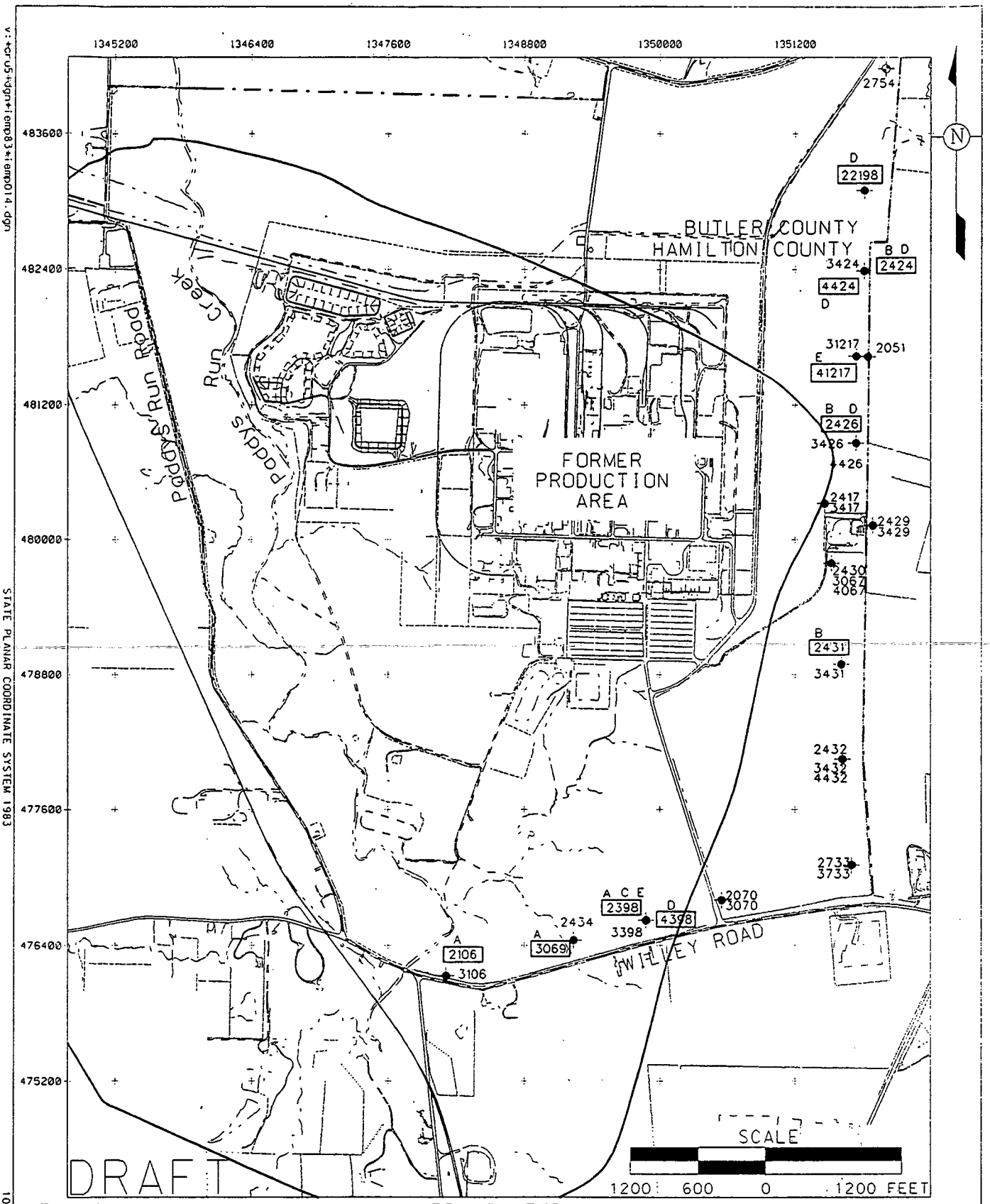


FIGURE 1-28. MODELED 1400 GPM PUMPING CONFIGURATION, PARTICLE TRACKS AND CAPTURE ZONE



LEGEND:

- FEMP BOUNDARY
- 3106 MONITORING WELL
- 10-YEAR, URANIUM-BASED RESTORATION FOOTPRINT

FRL EXCEEDANCE KEY:

- A 3069 WELL WITH FRL EXCEEDANCE
- A URANIUM, TOTAL
- B MANGANESE
- C NICKEL
- D ZINC
- E CHROMIUM, TOTAL

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FIGURE 1-29. FRL EXCEEDANCES FOR RCRA PROPERTY BOUNDARY MONITORING WELLS FOR JANUARY AND APRIL 1997

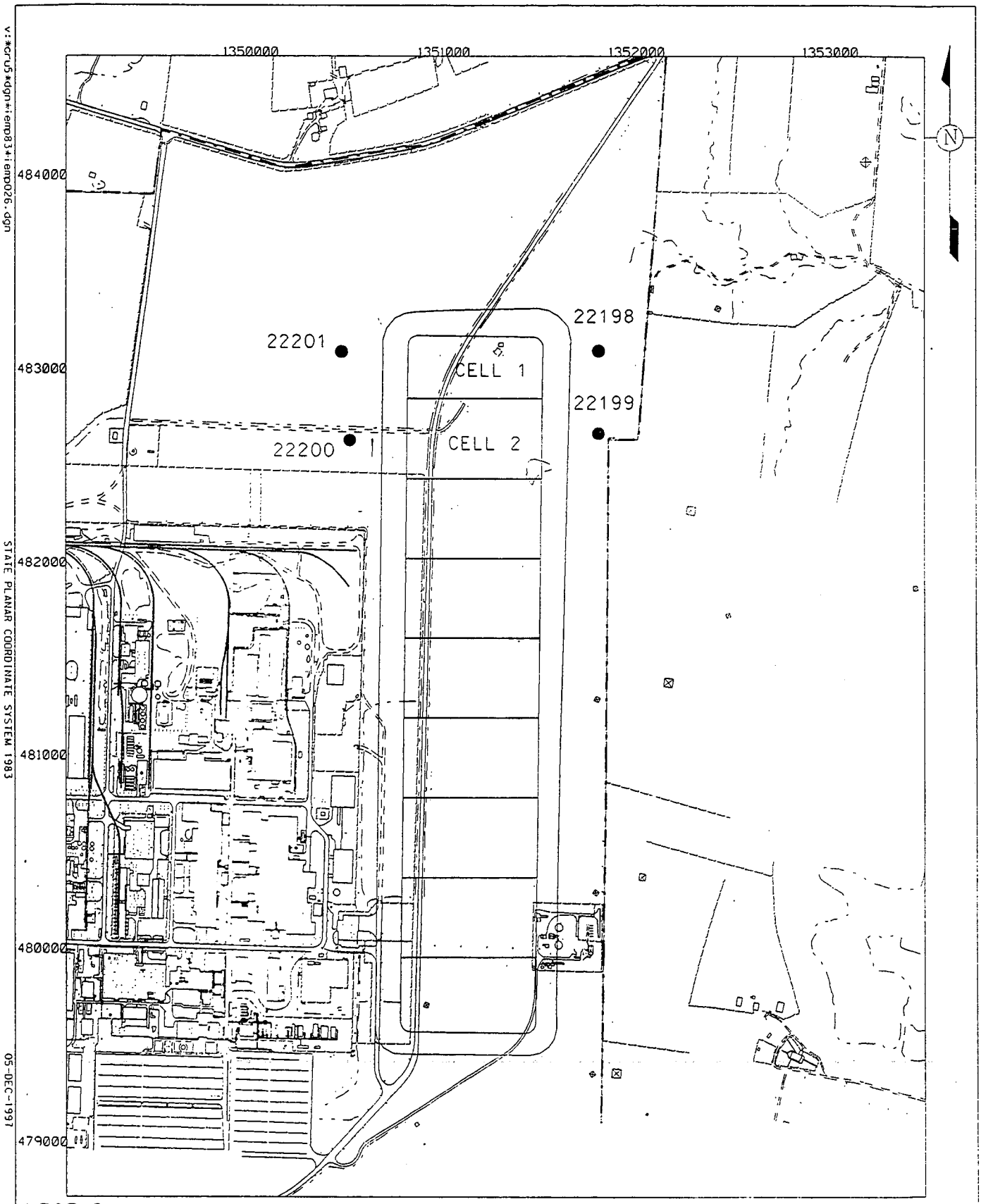


FIGURE 1-30. OSDF WELL LOCATIONS

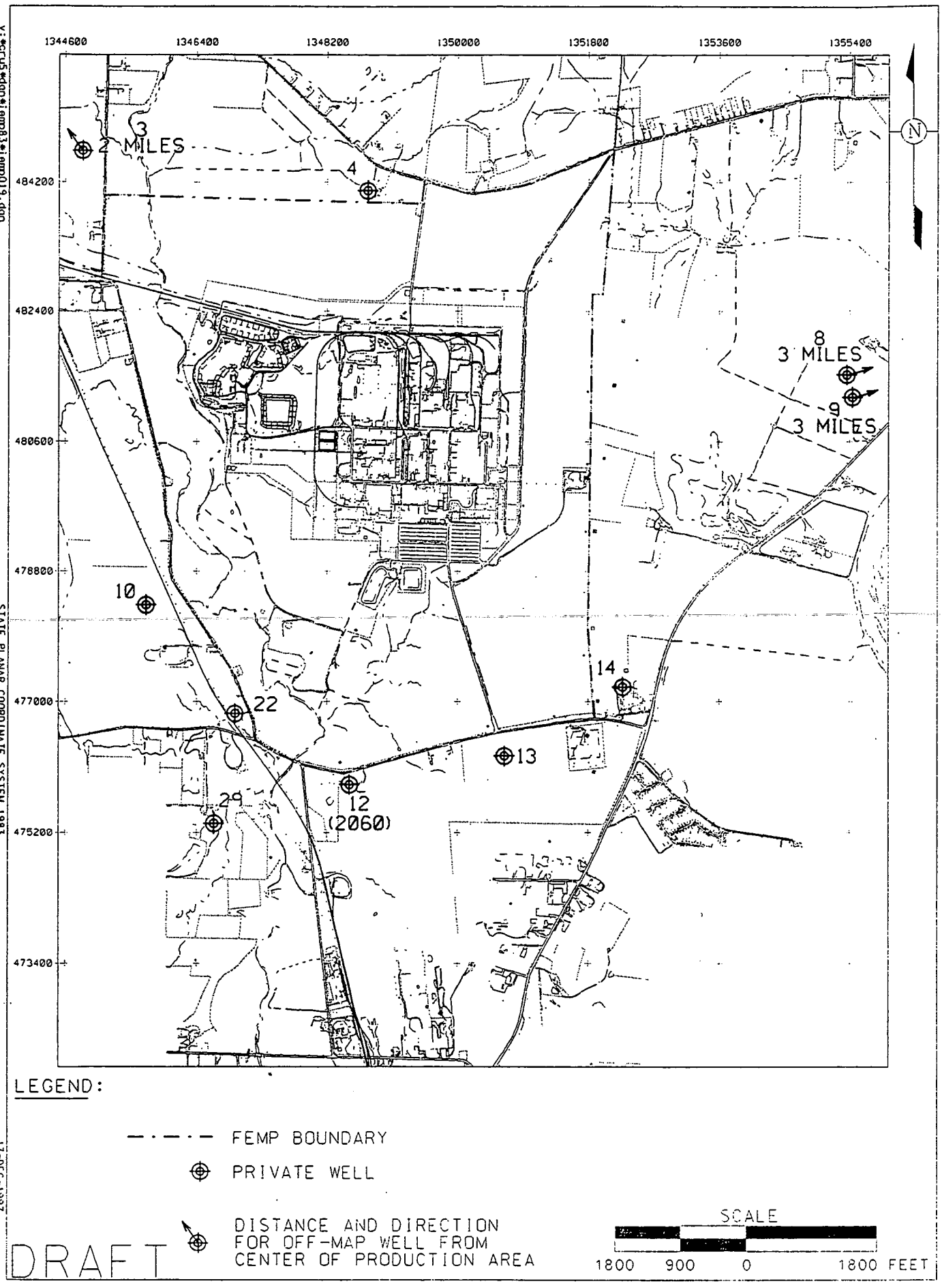
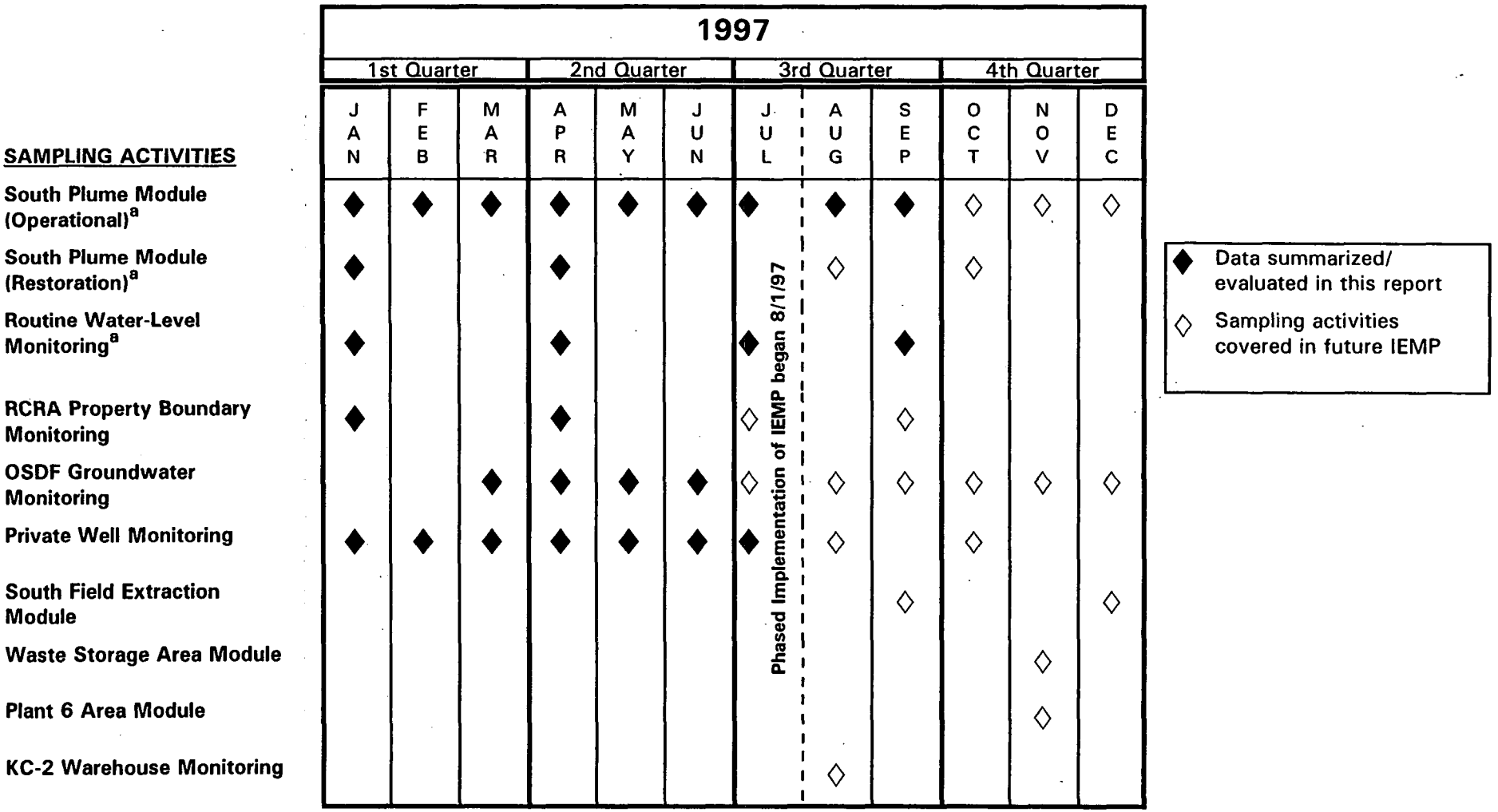


FIGURE 1-31. PRIVATE WELL MONITORING LOCATIONS

FIGURE 1-32

GROUNDWATER SAMPLING ACTIVITIES CONDUCTED IN 1997



[a]Reported in the semi-annual DMEPP System Evaluation Report submitted to EPA and OEPA in October 1997

2.0 SURFACE WATER AND TREATED EFFLUENT UPDATE

2.1 INTRODUCTION

Figure 2-1 summarizes data included in this section. The activities and data evaluation presented in this section reflect pre-IEMP monitoring as the IEMP surface water and treated effluent sampling program was not implemented until August 1997. As such, the available data do not completely fulfill the data needs identified in the IEMP. However, this section presents the available 1997 surface water and treated effluent data in a manner consistent, to the degree possible, with the protocol outlined in the surface water and treated effluent reporting section of the IEMP (Section 4.6.2).

The reporting protocol specify that the following items are to be reported in the quarterly status reports:

- Results of data comparison to FRLs and benchmark toxicity values (BTVs)
- Status of Operable Unit 5 Record of Decision, Great Miami River effluent limits, which include the 20 μg/L and 600 pounds total uranium limit, in fulfillment of Federal Facilities Compliance Agreement (FFCA) requirements
- Status of National Pollutant Discharge Elimination System (NPDES) permit compliance
- Summary-level information on effectiveness of project-specific controls, as necessary, for interpretation of IEMP results.

Analytical results from three monitoring programs were utilized to complete the data evaluation presented in this section:

- Monitoring to fulfill the NPDES permit and permit renewal application (data obtained from January through September 1997)
- Monitoring to fulfill pre-IEMP FFCA requirements (data obtained from January through September 1997)
- Monitoring conducted to meet DOE Order 5400.1 and 5400.5 under the pre-IEMP Environmental Monitoring Program (EMP) (data obtained from January through July 1997).

Data collected in support of NPDES and FFCA will continue to be reported under the IEMP. The EMP is discontinued under the IEMP; however, the requirements of the DOE Orders will be met by sampling the locations identified in the IEMP.

Because the data were obtained prior to implementation of the IEMP, not all surface water and treated effluent data needs identified in the IEMP are fully met in this first quarterly status report. For example, minimal data were available to compare to FRLs and BTVs at key sampling locations (i.e., total uranium, radium-226, and radium-228 were the only constituents analyzed at the point where Paddys Run flows off property). Also, due to the minimal number of IEMP samples and related analyses, no interpretation of the cumulative performance of project-specific sediment control programs can be made at this time. However, it is anticipated that continued sampling under the IEMP will begin to alleviate these data limitations and more comprehensive interpretations will be possible in future IEMP status reports.

As shown in Figure 2-1, data results from the pre-IEMP FFCA and NPDES permit programs have been reported previously per each program's individual reporting requirements. Results from the EMP have not been reported previously.

Surface water samples in support of the EMP were collected from January through July 1997 at the 12 locations shown in Figure 2-2. All of the locations were sampled weekly, when possible, and analyzed for total uranium (i.e., if a location was dry or inaccessible, then a sample was not collected). Monthly composites for all but one location and bi-monthly composites at W5 were prepared and analyzed for radium-226 and radium-228. Semi-annual composites (January through June) were also prepared for the Great Miami River locations and analyzed for cesium-137, strontium-90, and technetium-99. The Parshall Flume (PF 4001) and the Storm Water Retention Basin (SWRB 4002) are sampled to support the NPDES permit compliance, NPDES permit renewal, and FFCA. Additionally, locations at drainage ditches which flow into Paddys Run (STRM 4003, STRM 4004, STRM 4005, and STRM 4006) were sampled as part of NPDES permit compliance and NPDES permit renewal. Location STP 4601 is also sampled as part of NPDES permit compliance. Sampling locations for these programs are shown in Figure 2-3. NPDES locations are sampled at various frequencies for general chemistry and metals as specified in the NPDES permit (refer to Section 4.0 of the IEMP for constituents and frequencies). The most comprehensive sampling event of the reporting period supported the NPDES permit renewal. Target analytes consisted of general chemistry parameters, metals, organic compounds, and radiological constituents. Sampling in support of the FFCA is conducted primarily for total uranium; however, composite samples prepared from samples collected at

the Parshall Flume (PF 4001) are analyzed for additional radiological constituents. Analytical results from these composite samples, presented annually in the SER, will be included in the transitional IEMP annual report for 1997.

2.2 SURVEILLANCE MONITORING RESULTS

Although the IEMP was not fully implemented during this reporting period, available data were compared to the FRLs and BTVs to begin fulfilling the IEMP surface water surveillance function. Detection limits for several constituents associated with pre-IEMP surface water activities were above FRLs and/or BTVs; therefore, these results were not used in this data evaluation. With implementation of the IEMP, lower detection limits have been specified to eliminate this problem.

The point of compliance for FRL attainment in the Great Miami River, as stated in the Operable Unit 5 Record of Decision, will be outside the mixing zone. Therefore, the following conservative calculation was applied to data from the Parshall Flume (PF 4001) to determine the concentration of each constituent in the Great Miami River outside the mixing zone for comparison to the FRLs and BTVs:

$$C_{PF4001} = \frac{[Q_{10}]\ [C_{GMR}] + [Q_{PF}]\ [C_{PF}]}{[Q_{10}] + [Q_{PF}]}$$

where:

C_{PF4001} = Flow weighted average concentration outside the mixing zone in the Great Miami River, picoCuries per liter (pCi/L) or milligrams per liter (mg/L)

Q_{10} = 7-day, 10-year low flow, 583 cubic feet per second (cfs)

C_{GMR} = Background concentration in Great Miami River from the Characterization of Background Water Quality for Streams and Groundwater (DOE 1994) pCi/L or mg/L (0 was used when no background concentration was available)

Q_{PF} = Daily flow at Parshall Flume (PF 4001), cfs

C_{PF} = Daily concentration at Parshall Flume (PF 4001), pCi/L or mg/L

Based on the calculation of data from the Parshall Flume (PF 4001), FRLs and BTVs were not exceeded outside the mixing zone in the Great Miami River.

On-property FRL exceedances (Table 2-1) were limited to six metals: beryllium, copper, total chromium, lead, manganese, and zinc; and a semi-volatile organic compound: bis(2-ethylhexyl)phthalate. The FRL exceedances occurred at SWRB 4002 (associated with the Storm Water Retention Basin overflow), STRM 4003, STRM 4004, STRM 4005, and STRM 4006 (drainage ditches which flow into Paddys Run). With the exception of bis(2-ethylhexyl)phthalate, each of these exceedances was less than an order of magnitude above the FRL. Copper and total chromium FRL exceedances appear to be the most prevalent at this time. Note that no FRL exceedances for total uranium, the most ubiquitous and sampled constituent of concern, were observed.

The above noted occasional, sporadic exceedances are to be expected until site remediation is fully complete. What is important is to identify and evaluate trends in the data and also to determine if the exceedances persist at the property boundary locations. At this time, insufficient data is available to determine trends or to evaluate property boundary conditions in Paddys Run. However, with full implementation of the IEMP, trending of the data will be possible. This trending will provide for a more comprehensive interpretation of the significance of these exceedances.

BTV exceedances also were limited to metals and bis(2-ethylhexyl)phthalate (Table 2-2). These exceedances occurred at STRM 4003, STRM 4004, STRM 4005, and STRM 4006. The BTV exceedances for aluminum, barium, total chromium, and manganese appear to be the most prevalent. As with the FRL exceedances, insufficient data exists to determine if the on-property BTV exceedances persist at the property boundary location in Paddys Run. With full implementation of the IEMP, more comprehensive sampling has been initiated and results will be interpreted to determine the significance of these exceedances.

As discussed in Section 4.4.2.4 of the IEMP, historical total uranium concentrations in the Pilot Plant Drainage Ditch (W10DD) have consistently exceeded the surface water FRL for total uranium. However, in 1996, engineering controls were placed at the Pilot Plant Drainage Ditch to reroute contaminated surface water to treatment. Figure 2-4 shows the dramatic effect these controls have had on lowering the total uranium concentration at this location.

Figure 2-5 summarizes the average annual total uranium concentration in Paddys Run at Willey Road (W7). Figure 2-6 shows the monthly total uranium concentrations at W7 from January through June 1997. (Note: There are no data for July due to low rainfall). Figure 2-7 shows the rainfall totals by month for 1997. A slightly elevated total uranium concentration (18 μg/L) at W7 on June 4, 1997 was likely due to excessive amounts of rainfall in May and June, which resulted in an overflow at the Storm Water Retention Basin in early June 1997. This concentration was still below both the surface water (530 μg/L) and groundwater (20 μg/L) FRL for uranium.

2.3 FFCA AND OPERABLE UNIT 5 RECORD OF DECISION COMPLIANCE

Radiological discharges to the Great Miami River are not regulated under the current NPDES permit; however, radiological discharges are monitored at the Parshall Flume (PF 4001) per the FFCA and the Operable Unit 5 Record of Decision. The Operable Unit 5 Record of Decision stipulates that no more than 600 pounds of uranium per year can be discharged to the Great Miami River via the Parshall Flume (PF 4001). Figure 2-8 shows that the total cumulative pounds of uranium (112 pounds) discharged to the Great Miami River through September 1997 is well below the 600 pound annual limit established in the Operable Unit 5 Record of Decision.

The Operable Unit 5 Record of Decision also stipulates compliance with a monthly flow-weighted average uranium concentration of 20 μg/L at the Great Miami River via the Parshall Flume (PF 4001) beginning on January 1, 1998. However, the DOE is currently monitoring total uranium concentrations at the Parshall Flume (PF 4001) to assess compliance prior to the implementation date. Figure 2-9 shows that the FEMP has achieved compliance with the future limit for January through September. As noted in the figure, the Operable Unit 5 Record of Decision allows the FEMP to eliminate the flow-weighted concentration for up to 10 bypass days due to excessive precipitation each year in order to comply with the future 20 μg/L limit. Through the end of September, six of the 10 allowable excessive precipitation days would have been utilized to maintain compliance, had the limit been in effect. Additionally, during scheduled treatment plant maintenance activities, a storm water-related bypass occurred on August 18, 19, and 20. Bypassing during scheduled treatment plant maintenance is permissible under the Operable Unit 5 Record of Decision; therefore, had the 20 μg/L discharge limit been in effect, the August bypass days would not have been considered in the calculation of the monthly average. These data have been reported previously in the FFCA quarterly reports submitted to both the U.S. Environmental Protection Agency (EPA) and OEPA.

2.4 NPDES PERMIT COMPLIANCE

Wastewater and storm water discharges from the FEMP were in compliance with the current permit requirements 99.8 percent of the time during the reporting period of January through September 1997. With the exception of total suspended solids exceeding permit requirements at the Parshall Flume (PF 4001) two times during routine bypass events, all parameters were within permit limits. Appropriate notification and noncompliance reporting protocol were followed. This information was submitted previously to the OEPA through the NPDES permit reporting mechanism.

2.5 FINDINGS AND FUTURE FOCUS

The principal findings from the reporting period are summarized below:

- **NPDES Permit Compliance** - Surface water and treated effluent discharges were in compliance 99.8 percent of the time from January through September 1997. Total suspended solids exceeded permit limits two times during bypass of storm water to cause the noncompliances, which were reported in accordance with the site NPDES permit requirements.

- **FFCA and Operable Unit 5 Record of Decision Compliance** - The cumulative total of 112 pounds of uranium discharged to the Great Miami River through September was well below the stipulated annual limit of 600 pounds. Additionally, the future limit of a monthly average uranium concentration of 20 μg/L in water discharged to the Great Miami River (effective January 1, 1998) was met during January through September.

- **Surveillance Monitoring**

  - Based on available data, no FRL or BTV exceedances attributable to the FEMP were observed in the Great Miami River.

  - FRL exceedances for six metals and one semi-volatile organic compound were observed at various on-property sampling locations. These occasional, sporadic exceedances are to be expected until site remediation is fully completed. Due to the recent implementation of the IEMP sampling programs, insufficient data are currently available to fully evaluate trends in the data. It is anticipated that future data collected under the IEMP will allow for more comprehensive interpretation of the significance of these exceedances.

  - Sampling at the property boundary in Paddys Run indicates that total uranium concentrations in surface water leaving the site are consistently below both the surface water FRL and the groundwater FRL.

- Sampling within the Pilot Plant Drainage Ditch indicates the total uranium concentrations have decreased dramatically since the installation of a sump at the headwaters of the ditch. This sump now routes the more highly contaminated water to treatment.

- No surface water FRL exceedances were observed for total uranium, the most ubiquitous site constituent of concern.

Figure 2-10 shows all the locations sampled in accordance with the IEMP. Figure 2-11 shows the surface water and treated effluent sampling activities that have been and will continue to be conducted in 1997. This figure supplements Figure 2-1 and shows what data will be reported in future IEMP quarterly status reports. With implementation of the IEMP in August 1997, the NPDES and FFCA requirements continue to be fulfilled and a more comprehensive surface water sampling program has been implemented to better assess the effects of remediation activities on surface water. As sufficient data becomes available, they will be presented in future IEMP status reports to: document exceedances, provide statistical analyses, compare to historical ranges, refine background concentrations, assess for cross-media impacts, and determine if additional administrative or engineering controls are required.

The next IEMP quarterly status report will be submitted in March 1998. It will contain NPDES and FFCA data from October 1 through December 31, 1997 (fourth quarter), and the results of the analytical data from the remaining IEMP Characterization Program (sampling not conducted for NPDES or FFCA) for the third quarter, July 1 through September 30, 1997.

TABLE 2-1
SURFACE WATER LOCATIONS WITH RESULTS ABOVE THE FRL, INCLUDING SUMMARY STATISTICS

Location	Constituent	Total Number of Samples[a,b]	Number of Samples with FRL Exceedances[b]	FRL[c] (mg/L)	Summary Statistics[b,d] Min.[e] (mg/L)	Max. (mg/L)	Avg. (mg/L)	Results with FRL Exceedances (Date Sampled) (mg/L)
SWRB 4002 (Storm Water Retention Basin Overflow)	Copper	1	1	0.012	NA	NA	NA	0.016 (6/1/97)
STRM 4003 (Southern Paddys Run Drainage Ditch)	Chromium, Total	2	1	0.01[f]	0.003	0.021	NA	0.021 (6/16/97)
	Copper	2	2	0.012	0.014	0.016	NA	0.014 (6/02/97) 0.016 (6/16/97)
	Lead	1	1	0.01	NA	NA	NA	0.015 (6/16/97)
STRM 4004 (Paddys Run Drainage Ditch Near Inactive Flyash Pile)	Beryllium	1	1	0.0012	NA	NA	NA	0.0016 (8/20/97)
	Chromium, Total	2	1	0.01[f]	0.003	0.029	NA	0.029 (8/20/97)
	Copper	2	2	0.012	0.017	0.029	NA	0.017 (6/2/97) 0.029 (8/20/97)
	Lead	1	1	0.01	NA	NA	NA	0.0154 (8/20/97)
STRM 4005 (Pilot Plant Drainage Ditch)	Beryllium	1	1	0.0012	NA	NA	NA	0.0021 (7/22/97)
	Chromium, Total	2	1	0.01[f]	0.003	0.042	NA	0.042 (7/22/97)
	Copper	2	1	0.012	0.007	0.045	NA	0.045 (7/22/97)
	Lead	1	1	0.01	NA	NA	NA	0.026 (7/22/97)
	Manganese	1	1	1.5	NA	NA	NA	1.57 (7/22/97)
	Zinc	1	1	0.11	NA	NA	NA	0.27 (7/22/97)
	bis(2-Ethylhexyl)phthalate	1	1	0.0084	NA	NA	NA	0.0230 (7/22/97)
STRM 4006 (Northern Paddys Run Drainage Ditch)	Copper	2	1	0.012	0.0081	0.017	NA	0.017 (6/2/97)

[a]Total number of samples for all programs including NPDES, NPDES permit renewal, FFCA, and pre-IEMP Environmental Monitoring Program
[b]If more than one sample is collected per surface water location per day (e.g., duplicate, grab, composite), then only one sample is counted for the total number of samples, and the sample with the maximum concentration is used for the summary statistics and in determining FRL exceedances.
[c]From OU5 ROD, Table 9-5
[d]If the total number of samples is greater than or equal to three, then the minimum, maximum, and average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then none of the summary statistics are reported.
[e]For values where the lowest concentration is below the detection limit, the minimum value is set at half the detection limit.
[f]FRL based on chromium VI, from OU5 ROD, Table 9-5

TABLE 2-2

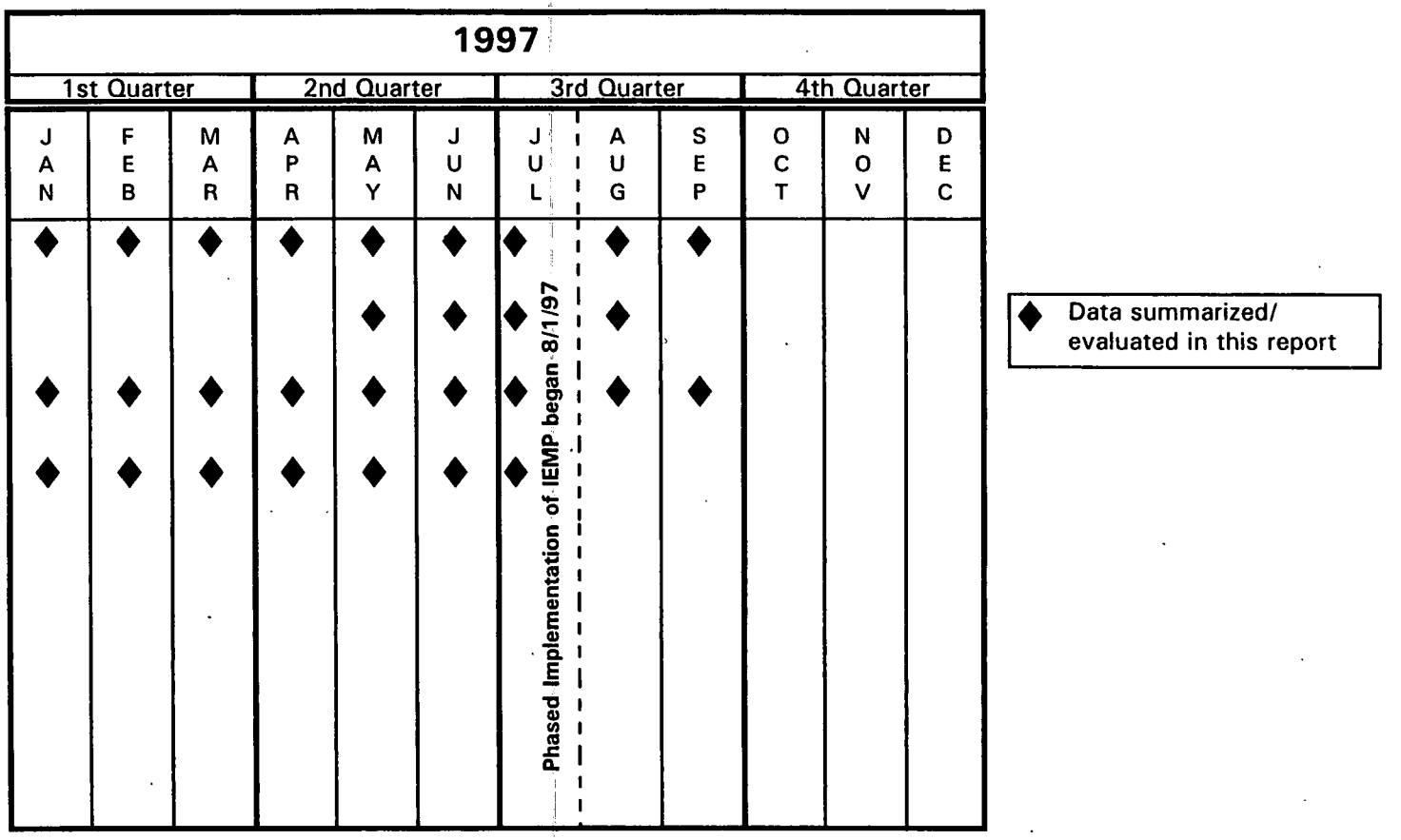
SURFACE WATER LOCATIONS WITH RESULTS ABOVE THE BTV, INCLUDING SUMMARY STATISTICS

Location	Constituent[a]	Total Number of Samples[b,c]	Number of Samples with BTV Exceedances[c]	BTV[d] (mg/L)	Summary Statistics[c,e] Min.[f] (mg/L)	Max. (mg/L)	Avg. (mg/L)	Results with BTV Exceedances[a] (Date Sampled) (mg/L)
STRM 4003 (Southern Paddys Run Drainage Ditch)	Aluminum	1	1	0.087	NA	NA	NA	17.8 (6/16/97)
	Chromium, Total	2	1	0.011[g]	0.003	0.021	NA	**0.021 (6/16/97)**
	Manganese	1	1	0.098	NA	NA	NA	0.416 (6/16/97)
STRM 4004 (Paddys Run Drainage Ditch Near Inactive Flyash Pile)	Aluminum	1	1	0.087	NA	NA	NA	27.3 (8/20/97)
	Barium	1	1	0.145	NA	NA	NA	0.16 (8/20/97)
	Chromium, Total	2	1	0.011	0.003	0.029	NA	**0.0288 (8/20/97)**
	Manganese	1	1	0.098	NA	NA	NA	0.493 (8/20/97)
STRM 4005 (Pilot Plant Drainage Ditch)	Aluminum	1	1	0.087	NA	NA	NA	36.8 (7/22/97)
	Barium	1	1	0.145	NA	NA	NA	0.284 (7/22/97)
	Chromium, Total	2	1	0.011	0.003	0.042	NA	**0.042 (7/22/97)**
	Copper	2	1	0.034	0.007	0.045	NA	**0.045 (7/22/97)**
	Manganese	1	1	0.098	NA	NA	NA	**1.57 (7/22/97)**
	bis(2-Ethylhexyl)phthalate	1	1	0.0084	NA	NA	NA	**0.0230 (7/22/97)**
STRM 4006 (Northern Paddys Run Drainage Ditch)	Aluminum	1	1	0.087	NA	NA	NA	1.8 (5/24/97)
	Manganese	1	1	0.098	NA	NA	NA	0.116 (5/24/97)

[a]Bolded results are also FRL exceedances.
[b]Total number of samples for all programs including NPDES, NPDES permit renewal, FFCA, and pre-IEMP Environmental Monitoring Program
[c]If more than one sample is collected per surface water location per day (e.g., duplicate, grab, composite), then only one sample is counted for the total number of samples and the sample with the maximum concentration is used for the summary statistics and in determining BTV exceedances.
[d]From IEMP Table 3-2
[e]If the total number of samples is greater than or equal to three, then the minimum, maximum, and average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then none of the summary statistics are reported.
[f]For values where the lowest concentration is below the detection limit, the minimum value is set at half the detection limit.
[g]BTV based on chromium VI

FIGURE 2-1

SURFACE WATER AND TREATED EFFLUENT ACTIVITIES COVERED IN THIS REPORT



[a]Reported in the semi-annual DMEPP System Evaluation Report submitted to EPA and OEPA in October 1997
[b]Reported in the NPDES Application for Permit Renewal submitted to OEPA September 1997
[c]Reported to EPA and OEPA in the quarterly FFCA reports (radium-228 and technetium-99 were added to the program under the IEMP [8/1/97]. Reporting of these two constituents for August and September 1997, as well as for subsequent quarters, will be included later.)

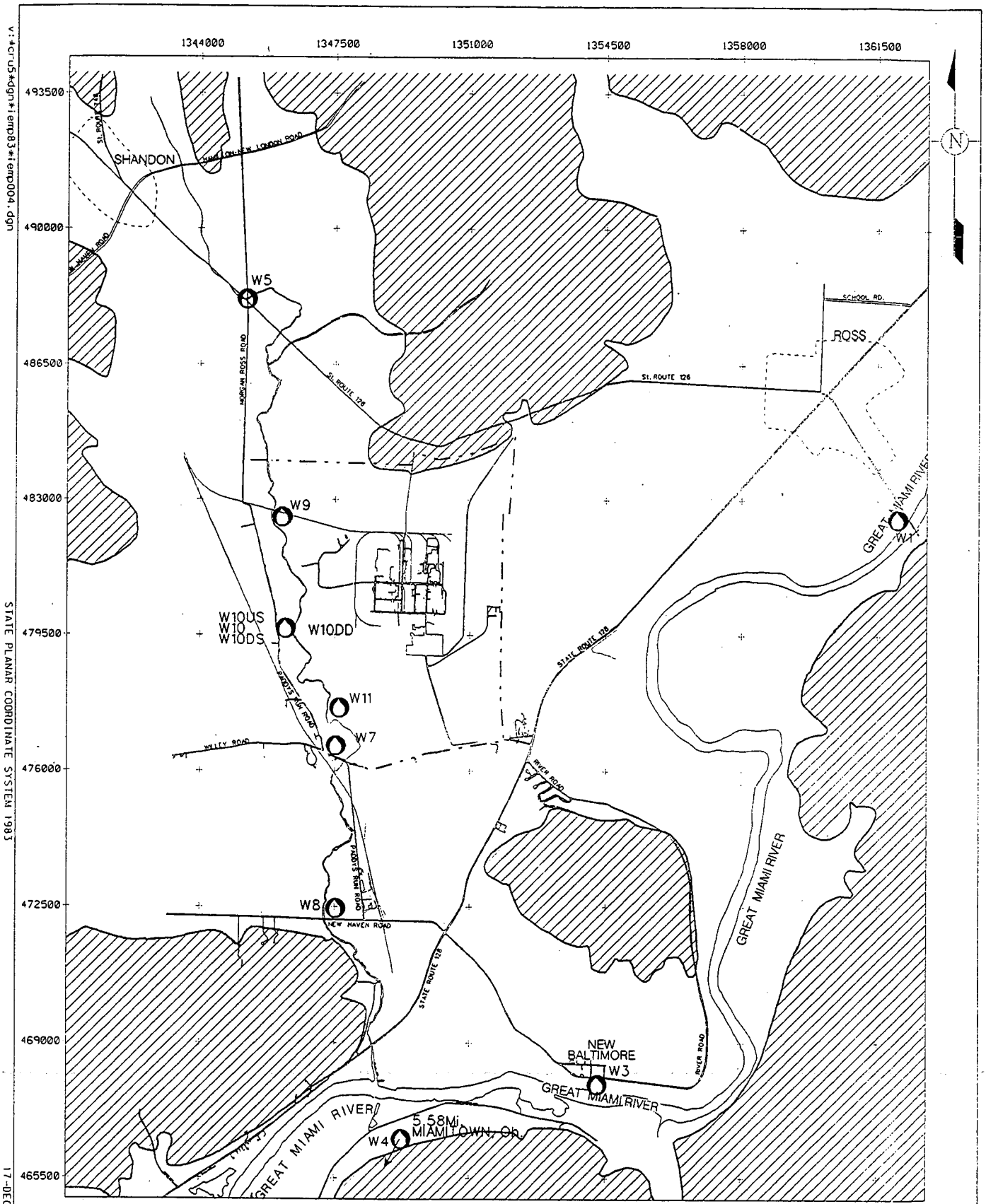


FIGURE 2-2. PRE-IEMP ENVIRONMENTAL MONITORING PROGRAM SURFACE WATER SAMPLE LOCATIONS

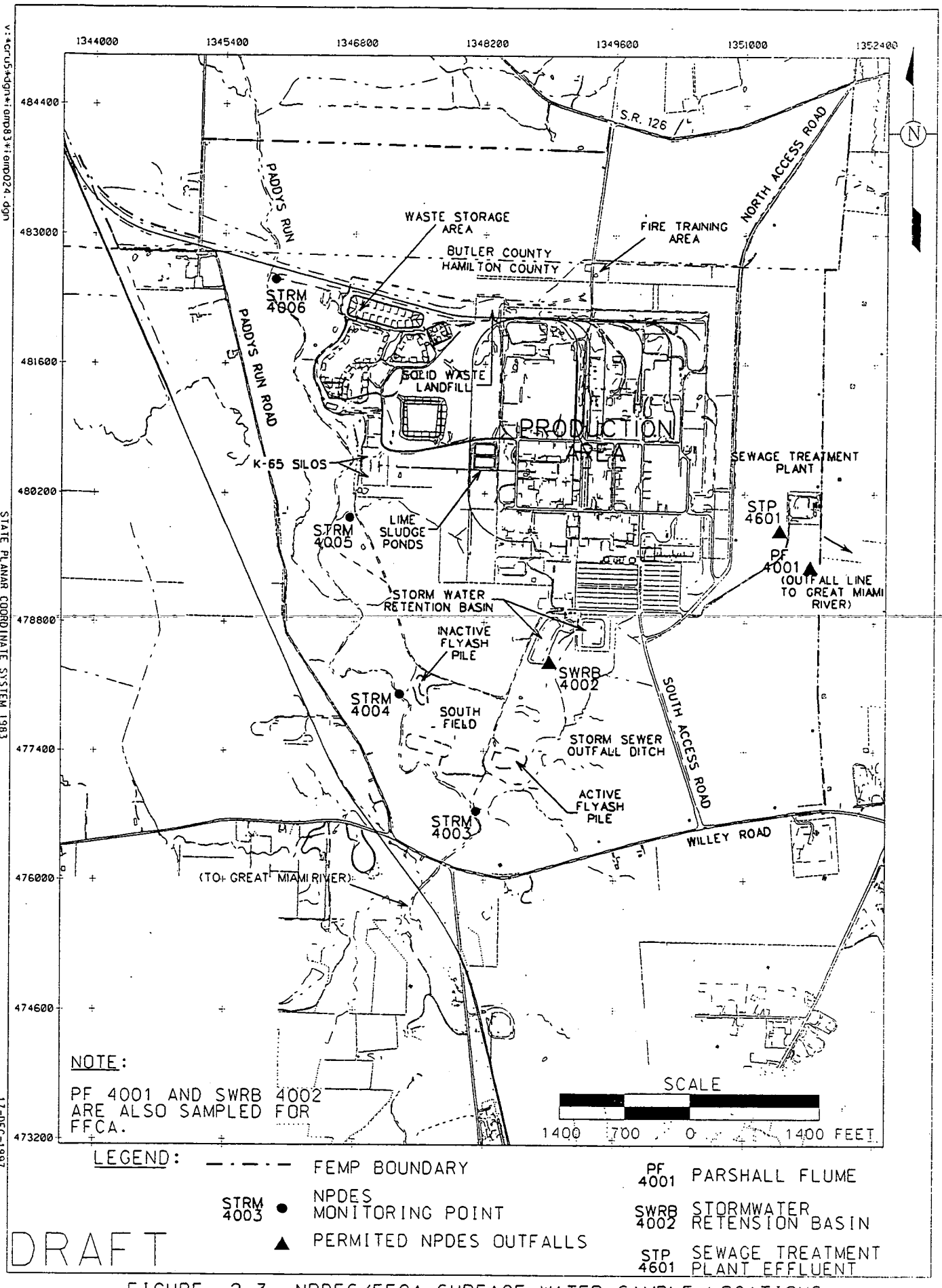
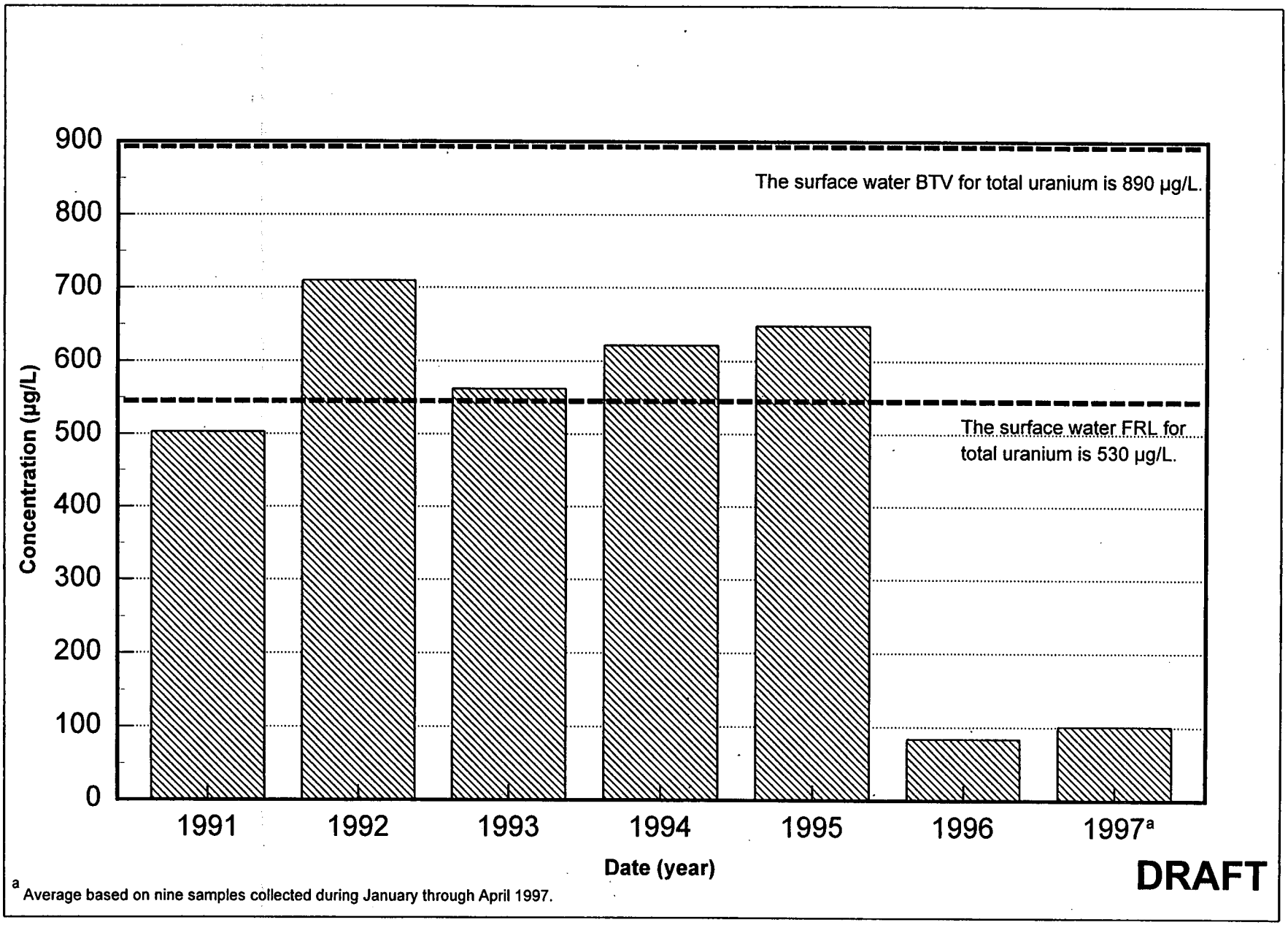
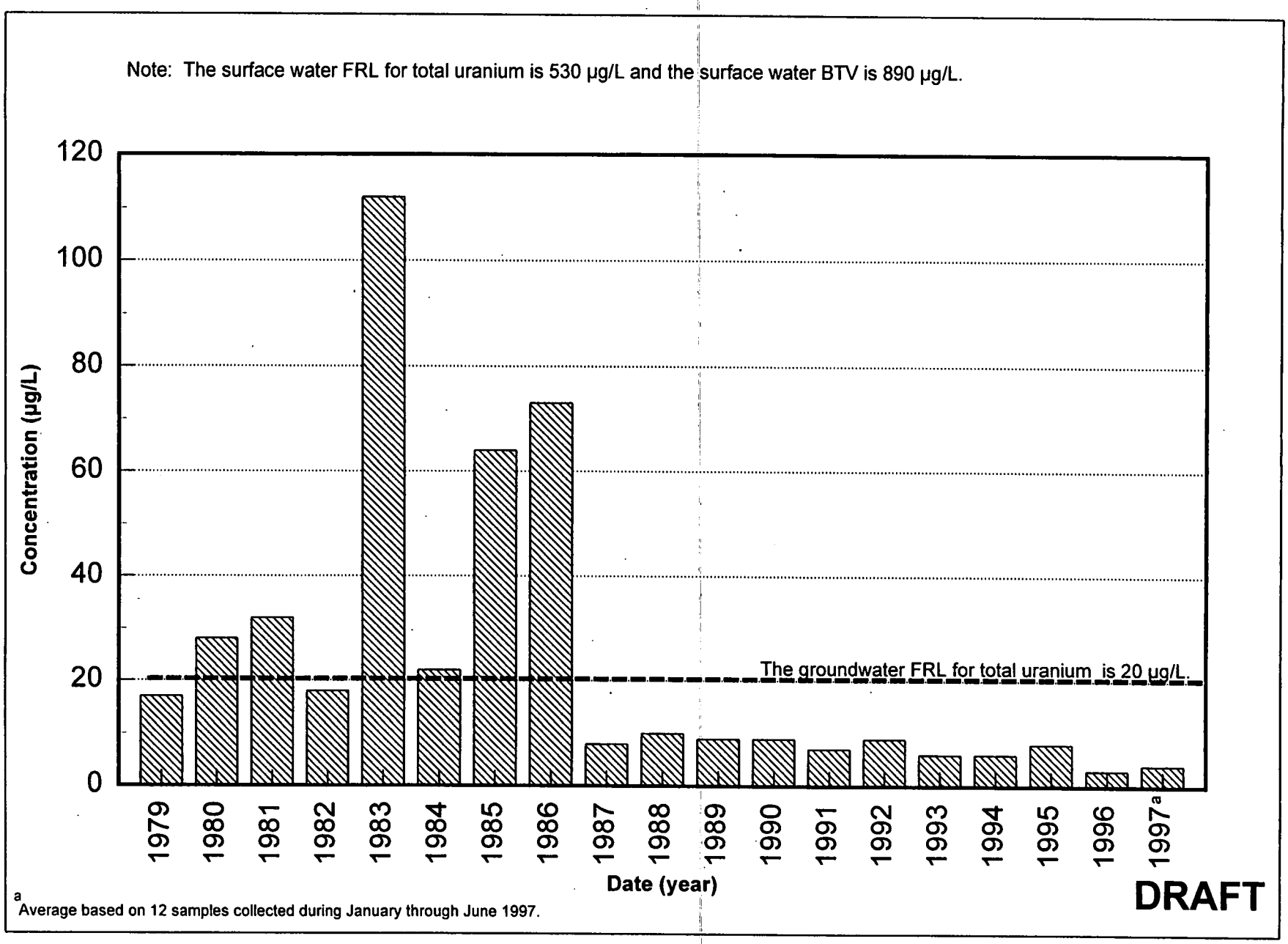


FIGURE 2-3. NPDES/FFCA SURFACE WATER SAMPLE LOCATIONS



[a] Average based on nine samples collected during January through April 1997.

FIGURE 2-4. AVERAGE ANNUAL TOTAL URANIUM CONCENTRATIONS IN THE PILOT PLANT DRAINAGE DITCH (W10DD) SAMPLING LOCATION



a Average based on 12 samples collected during January through June 1997.

FIGURE 2-5. AVERAGE ANNUAL TOTAL URANIUM CONCENTRATIONS IN PADDYS RUN AT WILLEY ROAD (W7) SAMPLING LOCATION

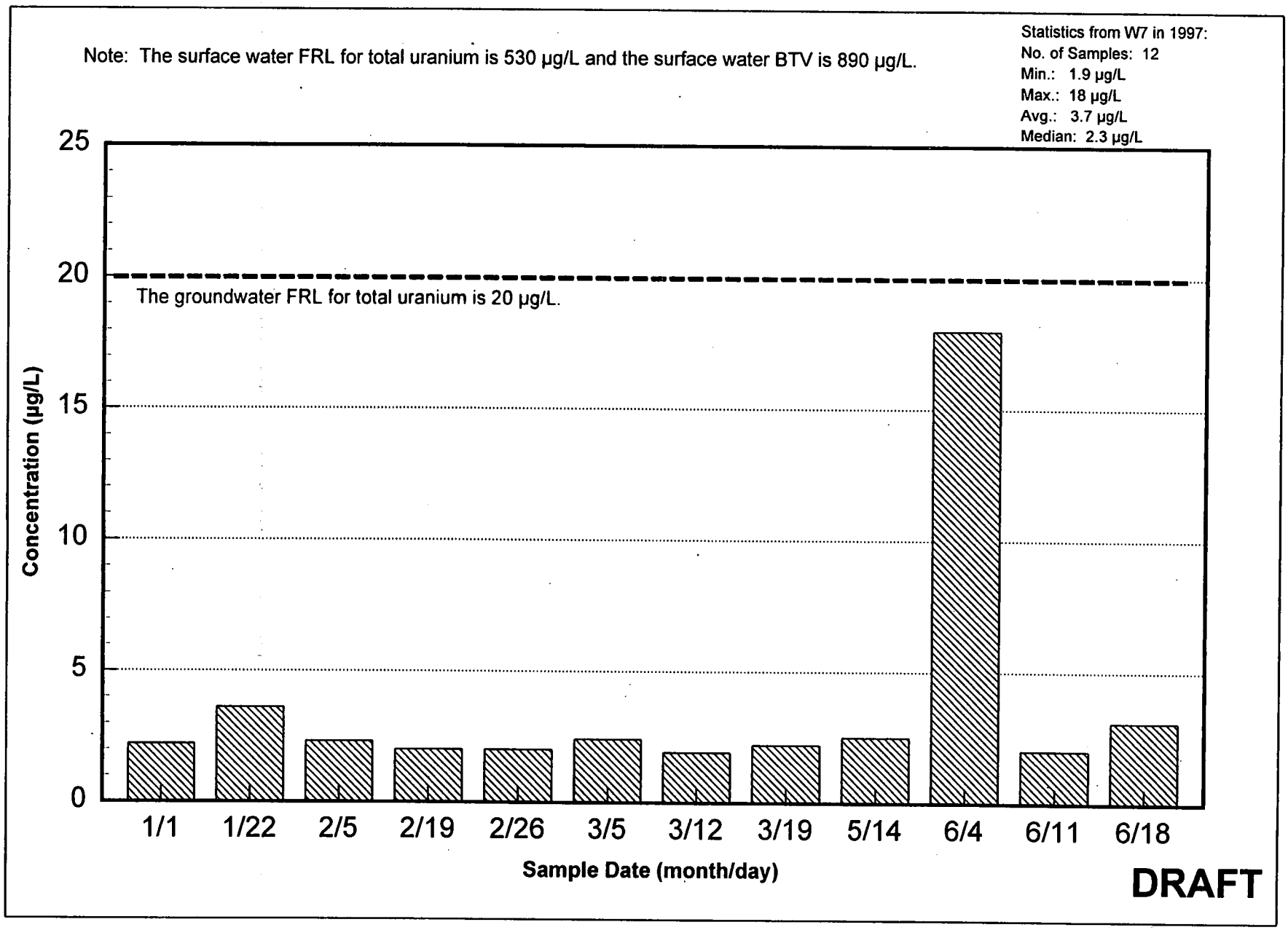
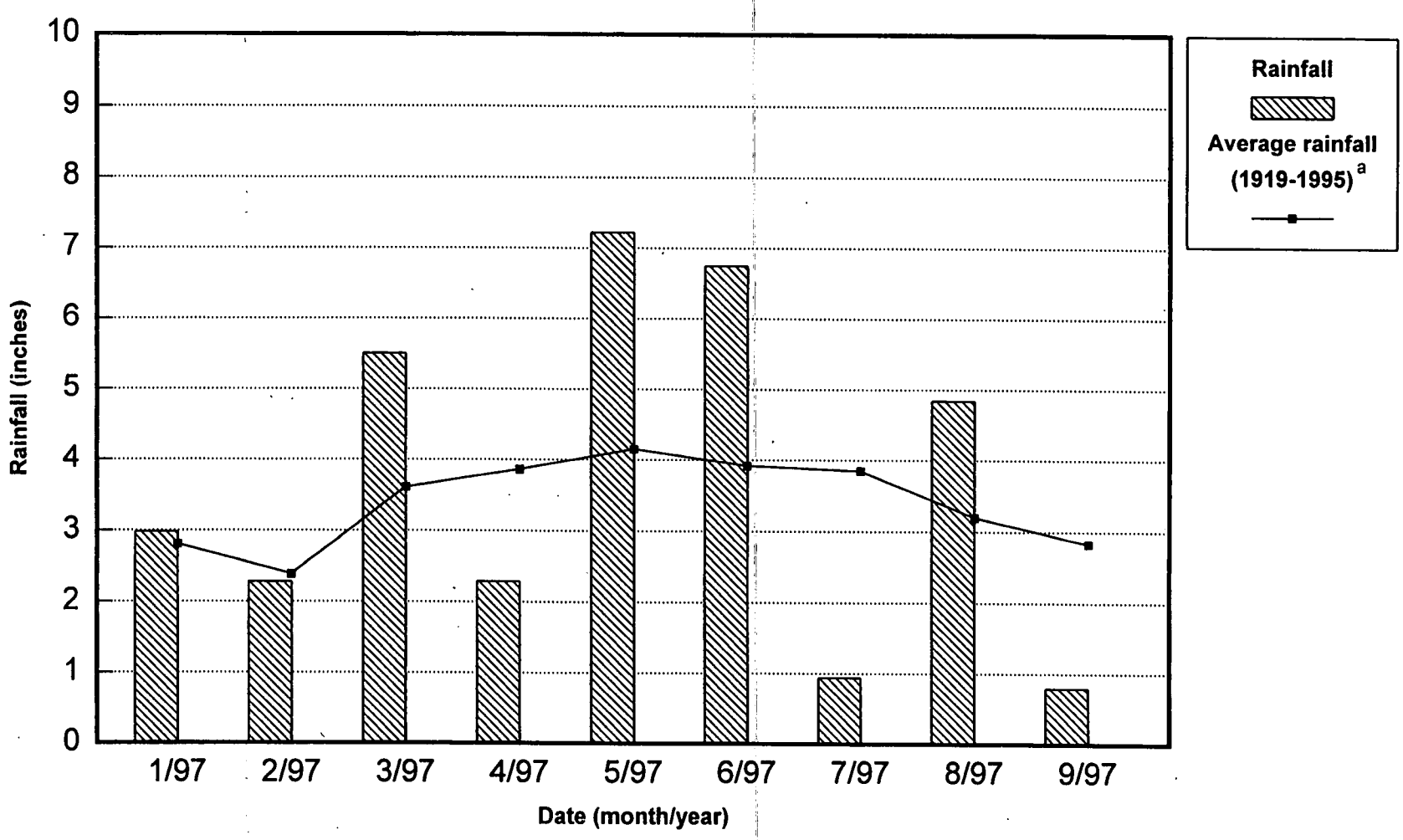


FIGURE 2-6. 1997 TOTAL URANIUM CONCENTRATIONS IN PADDYS RUN AT WILLEY ROAD (W7) SAMPLING LOCATION



[a] Average rainfall is based on data collected at the Greater Cincinnati/Northern Kentucky International Airport.

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FIGURE 2-7. 1997 RAINFALL TOTALS BY MONTH

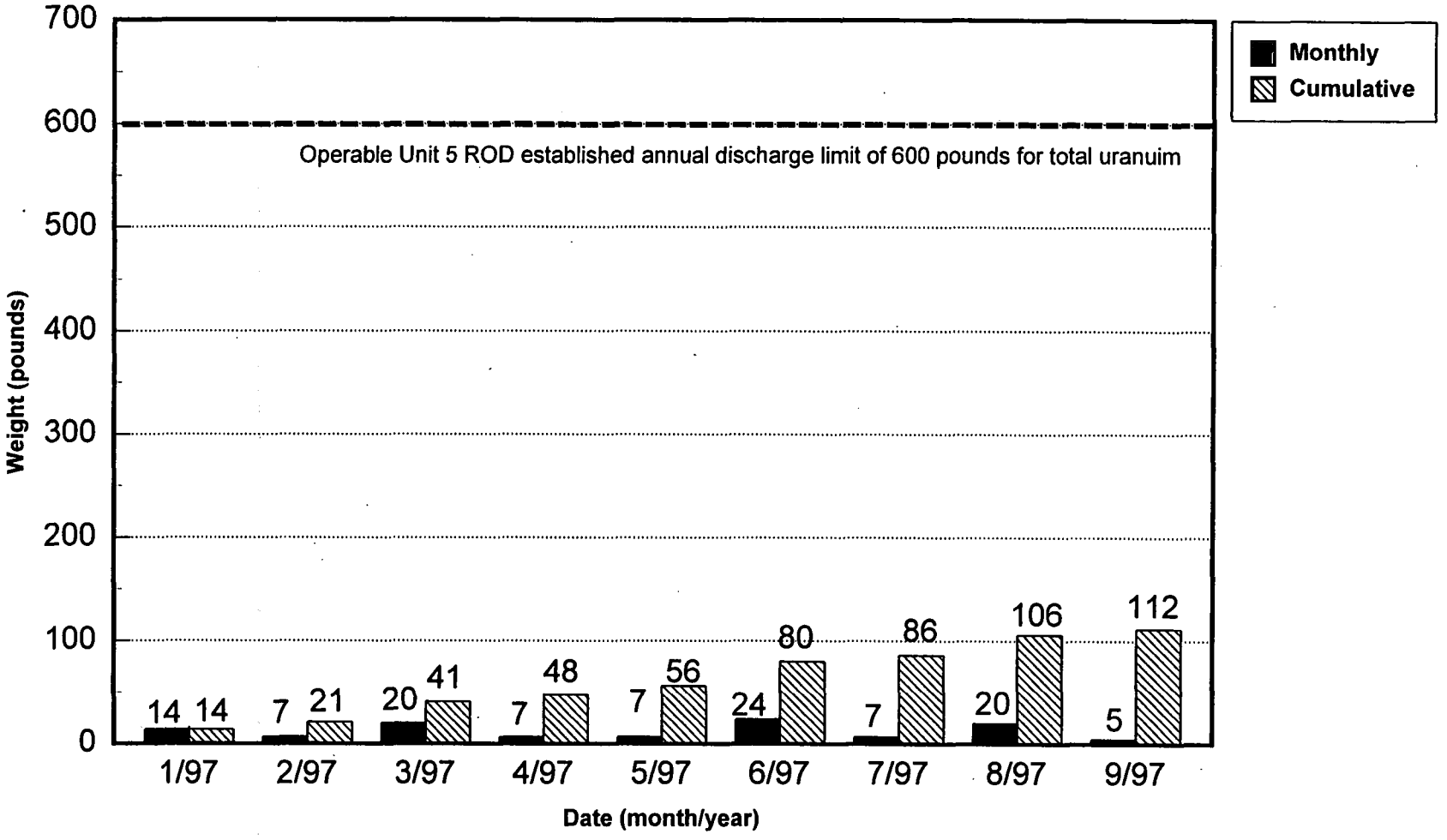


FIGURE 2-8. POUNDS OF TOTAL URANIUM DISCHARGED TO THE GREAT MIAMI RIVER FROM THE PARSHALL FLUME (PF 4001)

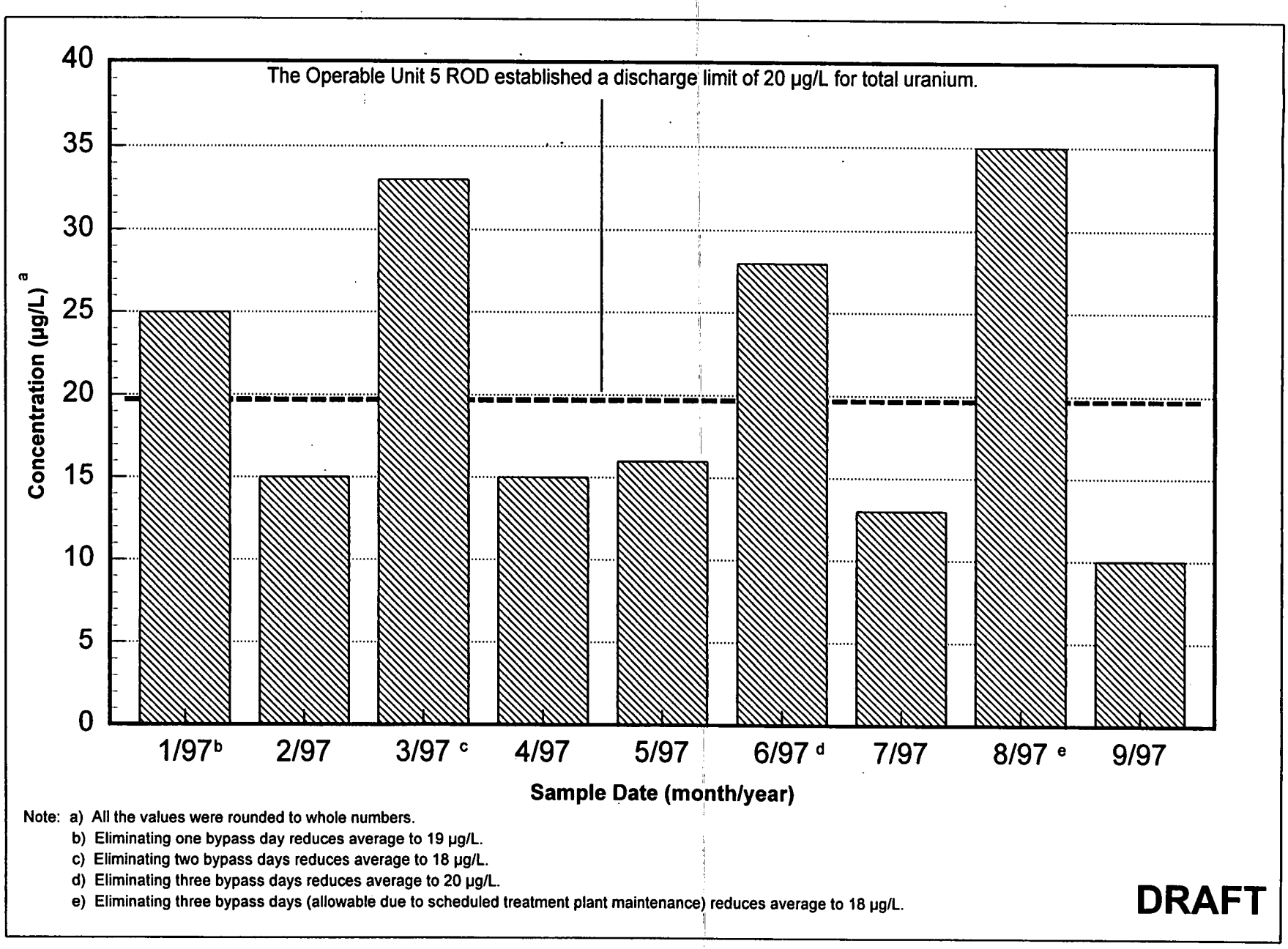


FIGURE 2-9. AVERAGE MONTHLY TOTAL URANIUM CONCENTRATIONS DISCHARGED FROM PARSHALL FLUME (PF 4001) TO THE GREAT MIAMI RIVER

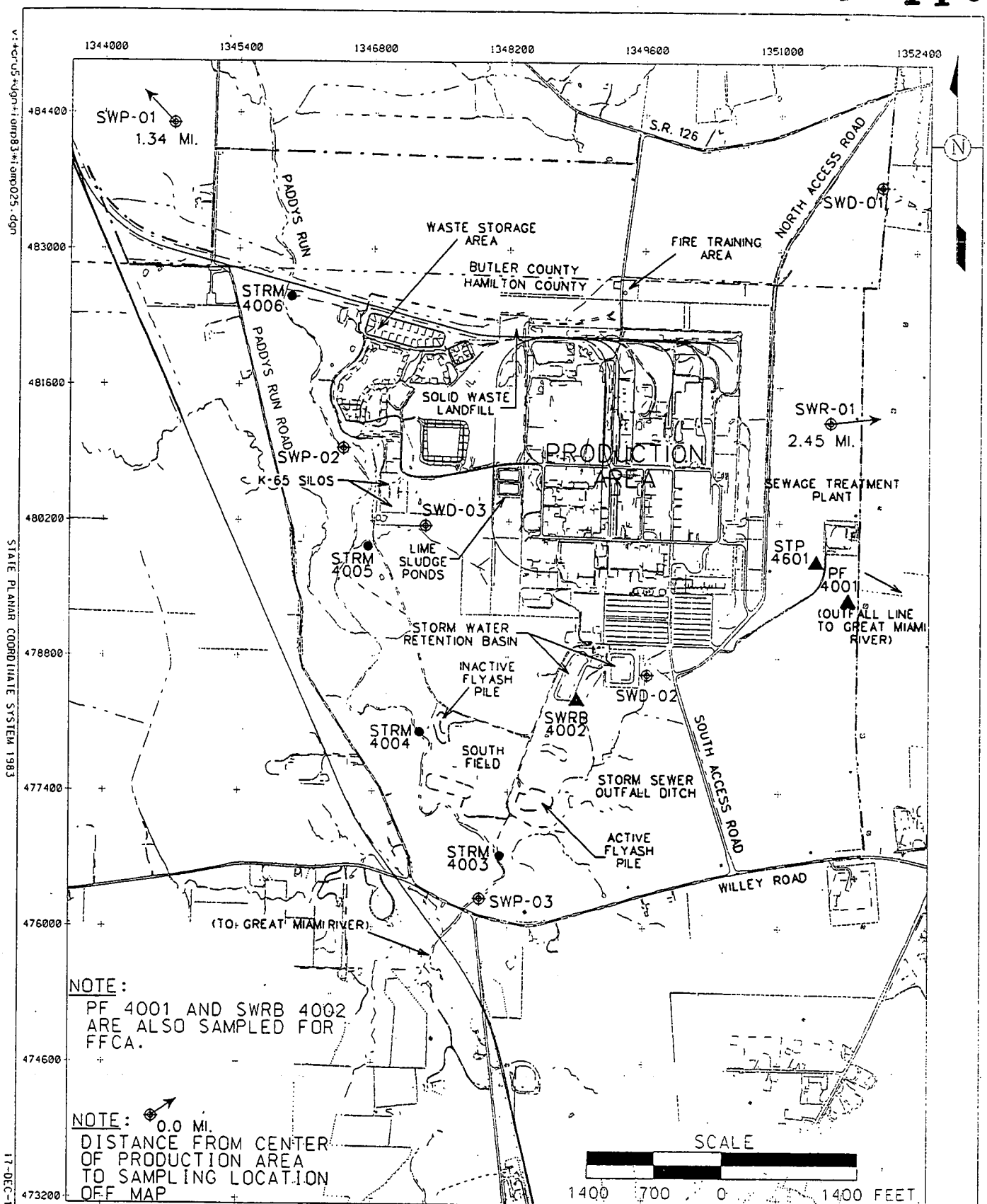
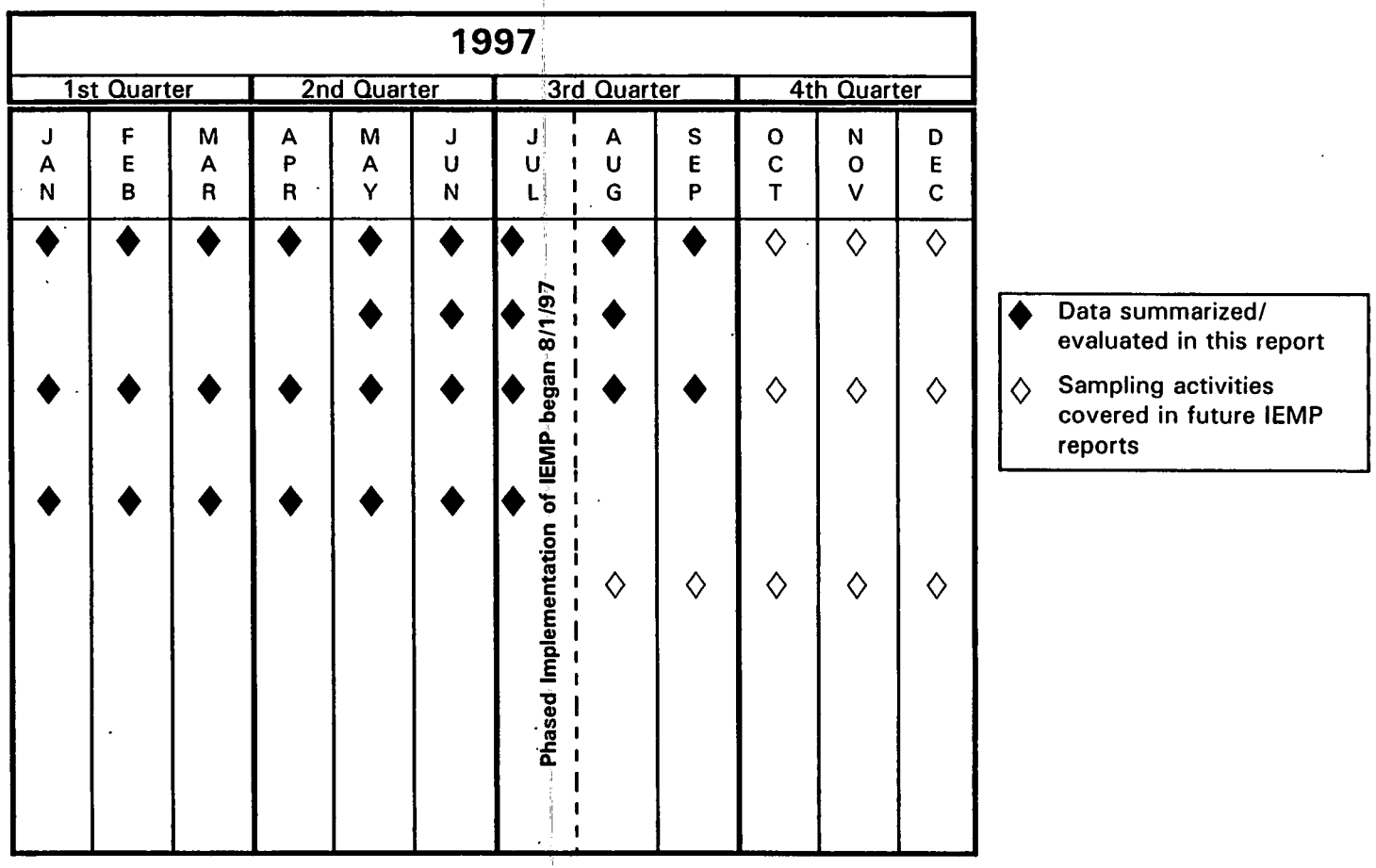


FIGURE 2-10. IEMP SURFACE WATER SAMPLE LOCATIONS

FIGURE 2-11

SURFACE WATER AND TREATED EFFLUENT ACTIVITIES CONDUCTED IN 1997



[a] Reported in the semi-annual DMEPP System Evaluation Report submitted to EPA and OEPA in October 1997
[b] Reported in the NPDES Application for Permit Renewal submitted to OEPA September 1997
[c] Reported to EPA and OEPA in the quarterly FFCA reports (radium-228 and technetium-99 were added to the program under the IEMP [8/1/97]. Reporting of these two constituents for August and September 1997, as well as for subsequent quarters, will be included later.)

3.0 AIR MONITORING UPDATE

3.1 INTRODUCTION

Figure 3-1 summarizes air data included in this section. This section provides a summary of the monitoring activities and analytical results for the FEMP air monitoring program for January 1, 1997 through September 30, 1997. Results for the following program elements are included in this section:

- Pre-IEMP Radiological Air Particulate Monitoring
- Radon Monitoring
- Direct Radiation Monitoring (via thermolumiscent dosimeters [TLD])
- National Emissions Standards for Hazardous Air Pollutant (NESHAP) Stack Emissions Monitoring.

In addition, summary information on the following projects is also included:

- Transition to the monitoring-based NESHAP Subpart H compliance program defined in the IEMP
- Project-specific air monitoring activities in support of building complex decontamination and dismantlement (D&D) activities
- DOE-sponsored research project to evaluate the particle size distribution and associated dose contribution of the FEMP particulate emissions.

The information provided in this section for the routine program elements identified above primarily reflect monitoring activities as defined in the pre-IEMP EMP, and therefore, do not fully reflect the air monitoring program design for all program elements presented in the IEMP. Specifically, transition to the radiological air particulate monitoring program defined in the IEMP is currently underway and is briefly statused in this report. As such, the radiological air particulate data presented in this report reflect the monitoring locations and analytical requirements specified in the EMP. Nonetheless, the data evaluation criteria presented in Section 6.6 of the IEMP has been used to the extent possible as the basis for evaluating the air data presented in this report.

3.2 PRE-IEMP RADIOLOGICAL AIR PARTICULATE MONITORING

Air filters were exchanged every two weeks and analyzed for total uranium and total suspended particulate (TSP) from nine boundary fenceline locations and seven off-property locations (Figure 3-2). TSP measurements at the off-property locations were only conducted at AMS-12 and AMS-16 during this time due to the expected implementation of the IEMP and the subsequent elimination of the remaining off-site monitoring stations from the monitoring network. Air Monitoring Station(AMS)-1B has been removed from service due to interruption of power along the north side of the facility. This monitoring station lost power early in July 1997. Efforts to restore power on a continuous basis were not feasible in light of the remediation activities in this area. There is no impact by removing this air monitoring station from service because it was not identified as an IEMP location. Data for AMS-1B are reported through June 1997.

Total uranium results from the analyses of the air filters indicate that total uranium concentrations are within historical ranges (Table 3-1). TSP values are also within expected ranges when compared to historical data (Table 3-2).

An estimated year-to-date dose has been included for comparison to the NESHAP Subpart H compliance limit of 10 millirem (mrem) per year. (Note that this dose is an estimate based solely on total uranium values from biweekly total uranium analyses.) This dose is calculated from the fenceline monitoring station with the highest cumulative total uranium value, which through the first three quarters of 1997 equates to a 0.15 mrem dose at AMS-3. These data are reasonable considering AMS-3 is located on the east facility fenceline, downwind, and in close proximity to the major remediation activities occurring during the reporting period (i.e., Area 1, Phase I excavation and construction of the on-site disposal facility. Graphs depicting total uranium and TSP concentrations through time are provided in Figure 3-3 through Figure 3-9. Evaluation of the graphed data reveals no increasing trends.

3.2.1 Transition to the Monitoring Based NESHAP Subpart H Compliance Program

With approval of the IEMP, the FEMP initiated a transition to a monitoring based NESHAP compliance program (described in detail in Section 6.4.2.1 and Appendix C of the IEMP) that is comprised of a network of 16 high volume air monitoring stations located at the facility property

boundary and two background monitoring stations. The radiological air particulate data collected from these monitoring stations will be compared to values in 40 Code of Federal Regulations (CFR) 61, Appendix E, Table 2, to demonstrate NESHAP Subpart H compliance.

The transition to this monitoring network required the installation of eight new monitoring stations along the facility fenceline and the relocation of one existing fenceline monitor. To date, the installation and relocation activities are complete. The monitoring stations are currently undergoing operational testing in preparation for initiating the compliance monitoring program on January 1, 1998. Figure 3-14 shows the configuration of the new monitoring network. The data from this monitoring program will be presented beginning with the March 1998 IEMP quarterly status report.

The existing high volume air monitoring stations not included in the IEMP monitoring network will be removed from service by the end of 1997. These monitoring stations, which have been reported here, include AMS-10, AMS-11, AMS-13, AMS-14, and AMS-21.

3.2.2 Project-specific Radiological Air Particulate Monitoring

Project-specific radiological air particulate monitoring in support of Plant 1 D&D activities was completed May 23, 1997. This project was initiated in December 1995 and included weekly sampling for total uranium at four air monitoring stations located at the project boundary. Results from this effort were within the predicted range for total uranium results. The data for this effort have been reported to EPA in the draft Operable Unit 3 Plant 1 Complex Phase I Project Completion Report (DOE 1997g).

Additionally, project-specific radiological air monitoring activities will be initiated in October 1997 in support of Operable Unit 3 Decontamination and Dismantlement for the Plant 9/Thorium Complex. Five air monitoring stations will be deployed near the project boundary and filters will be collected weekly for total uranium analyses.

Total uranium was identified as the primary constituent based on process knowledge and engineering evaluations. As per Operable Unit 3, Integrated Remedial Action, Thorium/Plant 9 Complex Implementation Plan for Above-Grade Decontamination and Dismantlement (DOE 1997f), data from each building will be evaluated continually to ensure project emission controls perform as expected. Further, radiological assessments will be conducted prior to decontamination of Buildings 64 and 65 to

determine if thorium will represent a potential environmental air contaminant, and therefore, should be added to the routine analysis.

3.3 RADON MONITORING

Radon cups (alpha track-etch) were analyzed for the first six months of 1997. Long-term, integrated radon cups were collected from locations near the K-65 silos, at fenceline locations, at background locations, and at off-property locations (Figure 3-10). The results from this monitoring effort are compared to the annual average limit of 3 pCi/L (above background) at the facility fenceline prescribed by DOE Order 5400.5. Data reported are within historical ranges for this time period. Higher radon concentrations were recorded within the vicinity of the K-65 silos as expected (Table 3-3).

Continuous radon monitoring (Figure 3-11) was also conducted during this time period, utilizing alpha scintillation units (Pylon AB-5). These continuous monitors provide hourly readings which are used to establish compliance with the 100 pCi/L radon limit at any point on the facility, as defined in DOE Order 5400.5, and to observe short-term data trends. Between January 1 and September 30, 1997, there have been three exceedances of the 100 pCi/L radon limit due to atmospheric inversions, as confirmed by the site meteorological data. These exceedances, which occurred during the months of February, June, and September, were short-term, lasting no longer than two hours, and typically occurred during off-shift work hours between 01:00 and 04:00 a.m. These exceedances were observed at the K-65 exclusion fence monitoring locations. As in the past, these exceedances were associated with particularly strong atmospheric inversions rather than with any operational change associated with the K-65 Silos.

The first three quarters of 1997, continuous radon monitoring data have been submitted previously in the quarterly FFCA report, Enclosure C, and therefore, are not included in this report beyond the summary presented above. These data will continue to be reported through December 1997 in the quarterly FFCA report. Beginning with the first quarter data for 1998, the continuous radon monitoring data will be transitioned to the March 1998 IEMP quarterly status report.

3.4 DIRECT RADIATION MONITORING

Direct radiation measurements (via TLDs) have been recorded and reported here for the first three quarters of 1997. TLDs were collected each quarter from 13 boundary fenceline, seven on-site, four off-site, and six background locations (Figure 3-12). Data reported were within expected ranges as

compared to historical results (Table 3-4). There is no statistical difference between the direct radiation measurements taken at the facility fenceline and background locations. Therefore, there is no additional dose above background measured at the fenceline. Beginning in the fourth quarter of 1997, eight additional TLD locations were added at the new air monitoring stations installed under the IEMP radiological air particulate monitoring program.

3.5 NESHAP STACK EMISSIONS MONITORING

During the annual NESHAP inspection of the site in July 1997, EPA requested that stack data be included in the IEMP quarterly status reports. NESHAP compliance samples were collected from three stacks on a quarterly basis in 1997 (Figure 3-13). Data from Building 71, the laboratory stack, and the laundry stack are included through third quarter of 1997 (Table 3-5). Analyses for these stack filters include total uranium, thorium-230, thorium-232, and TSP. The trash compactor is also monitored as a source of radionuclide emissions by four area monitors that are collected daily and analyzed for total uranium and TSP. Because this emissions location is not a typical stack, EPA agreed to using area monitors to determine the uranium contributions from this emissions source. To date, the total pounds reported for the laboratory stack and laundry stack are within historical ranges. The data collected from the trash compactor is also within the expected range for total uranium. Building 71 began operating in January 1997, and therefore does not have a historical database for comparison.

The quarterly stack filters historically have been composited into a single annual composite and analyzed for a suite of radionuclides for use as a source term in the CAP-88 PC computer modeling for determining compliance with NESHAP Subpart H requirements. Beginning in 1998, the annual stack filter composites will be analyzed for the same radionuclides as the radiological air particulate quarterly composites to assist in interpreting data collected at the FEMP fenceline. This information will continue to be reported in the IEMP quarterly status reports.

3.6 AIR PARTICULATE MONITORING RESEARCH PROJECT

The DOE-FEMP and DOE Environmental Measurements Laboratory have initiated a research project to evaluate the particle size distribution of the FEMP particulate emissions. The objectives of the study are to evaluate the dose associated with various size fractions, and calculate the dose contribution from the respirable fraction of the total emission. The dose contribution of the respirable fraction is

considered by DOE to be an accurate representation of the dose received by workers and members of the public via the air pathway. Low volume drum impactors currently are being used for the air sampling being conducted to support this study.

A secondary objective of the study is to evaluate the performance of the drum impactors compared to the high volume air monitoring stations that are, and will continue to be, used for the FEMP's demonstration of NESHAP compliance. In the future, should the evaluation conclude that the impactors provide equivalent data, the DOE may recommend supplementing the high volume air monitoring stations with the impactors. The impactors are smaller and quieter than the high volume monitoring stations, and may be more acceptable for placement at the residences of potentially maximally exposed individuals. Monitoring at the nearest resident locations will be helpful to supply the public with the most accurate information available concerning their exposure from the FEMP airborne emissions.

This project was initiated the last week of October 1997. Preliminary data should be available for inclusion in the transitional IEMP annual report, to be issued in June 1998.

3.7 FINDINGS AND FUTURE FOCUS

The principle findings from the reporting period are summarized below:

- **Pre-IEMP Radiological Air Particulate Monitoring** - Total uranium and TSP data collected from the pre-IEMP monitoring network were within historical ranges and did not exhibit any increasing trends during January through September 1997. The maximum estimated dose at the facility fenceline through September 1997 was determined to be 0.15 mrem at AMS-3. This represents 1.5 percent of the 10 mrem NESHAP Subpart H limit. Based on this data evaluation, and the upcoming transition to the IEMP monitoring network, no additional actions are recommended at this time.

- **Transition to a Monitoring Based NESHAP Subpart H Compliance Program** - Installation of the eight new high volume air monitoring stations and relocation of one existing monitoring station on the FEMP property boundary is complete. The NESHAP compliance monitoring network consisting of 18 monitoring stations as defined in Section 6.4.2.1, and Appendix C of the IEMP, will begin compliance monitoring on January 1, 1998.

- **Radon Monitoring** - During January through September 1997, there were three exceedances of the 100 pCi/L radon limit specified in DOE Order 5400.5. All three exceedances, which were detected in continuous radon monitors located immediately adjacent to the K-65 silos, were of short-duration and were not observed outside the

immediate vicinity of the K-65 exclusion fence. As in the past, these exceedances were associated with particularly strong atmospheric inversions rather than with any operational change associated with the K-65 Silos. Based on the limited occurrence, short duration, and limited areal extent of the exceedances, no additional actions are planned.

- **Direct Radiation Monitoring** - All monitoring results from environmental direct radiation measurements for January through September 1997 were within historical ranges and exhibited no increasing trends. As such, monitoring will continue with no changes proposed at this time.

- **NESHAP Stack Emissions Monitoring** - The available data for the four monitoring locations are within historical ranges. There have been no significant changes in the operational configuration of the source operations associated with the monitored stacks or trash compactor area, which could contribute to a significant increase in emissions. As such, no additional actions are planned at this time.

Figure 3-15 shows the air monitoring activities that have been and will be conducted in 1997. The figure supplements Figure 3-1 and provides a forecast of the data that will be reported in future IEMP quarterly status reports. Activities as defined under the IEMP for radon and direct radiation monitoring will continue as planned. Operational testing of the air monitoring stations installed and relocated to implement the IEMP radiological air particulate monitoring program will be ongoing during the fourth quarter of 1997 in preparation for the initiation of compliance monitoring on January 1, 1998.

TABLE 3-1

RADIOLOGICAL AIR PARTICULATE - TOTAL URANIUM CONCENTRATIONS

First Quarter Results (pCi/m^3)[c,d]

Location[a,b]	# Samples	Min.	Max.	Avg.
AMS-1B	8	2.8E-04	8.1E-04	5.1E-04
AMS-2	8	1.5E-05	2.5E-04	7.4E-05
AMS-3	8	2.5E-06	2.1E-04	9.5E-05
AMS-4	8	0.0E+00	2.6E-05	1.3E-05
AMS-5	8	0.0E+00	2.7E-05	1.5E-05
AMS-6	8	5.1E-06	1.1E-04	5.4E-05
AMS-7	8	0.0E+00	1.5E-04	3.5E-05
AMS-8A	8	3.4E-05	1.8E-04	8.8E-05
AMS-9B	8	0.0E+00	2.0E-04	1.0E-04
AMS-10	8	8.6E-06	3.5E-05	2.0E-05
AMS-11	8	0.0E+00	1.5E-05	7.9E-06
AMS-12	8	0.0E+00	1.3E-05	4.5E-06
AMS-13	8	0.0E+00	1.8E-05	9.8E-06
AMS-14	8	0.0E+00	3.1E-05	1.3E-05
AMS-16	8	0.0E+00	2.7E-05	1.0E-05
AMS-21	8	0.0E+00	1.6E-05	5.4E-06

Second Quarter Results (pCi/m^3)[c,e]

# Samples	Min.	Max.	Avg.
6	1.3E-04	8.5E-04	4.6E-04
7	5.6E-06	1.1E-04	4.4E-05
7	5.3E-06	6.5E-04	2.4E-04
7	0.0E+00	2.6E-04	6.0E-05
7	7.7E-06	6.1E-05	2.2E-05
7	1.5E-05	1.4E-04	5.0E-05
7	1.3E-05	4.1E-05	2.8E-05
7	1.1E-05	2.3E-04	1.1E-04
7	2.6E-05	3.2E-04	1.4E-04
7	0.0E+00	4.5E-05	1.9E-05
7	2.9E-06	2.5E-05	1.2E-05
7	0.0E+00	2.9E-05	1.1E-05
7	5.5E-06	5.1E-05	2.0E-05
7	5.6E-06	3.7E-05	2.4E-05
7	0.0E+00	2.4E-05	1.1E-05
7	0.0E+00	3.2E-05	1.0E-05

Third Quarter Results (pCi/m^3)[c,f,g]

# Samples	Min.	Max.	Avg.
0	NS	NS	NS
6	1.5E-05	6.3E-05	3.8E-05
6	7.7E-05	4.6E-04	2.1E-04
6	1.9E-05	5.2E-05	3.7E-05
6	2.6E-06	2.2E-04	5.9E-05
6	2.0E-05	4.1E-05	3.3E-05
6	2.6E-05	5.2E-05	3.9E-05
6	2.1E-05	1.4E-04	7.1E-05
6	3.6E-05	1.9E-04	9.1E-05
6	5.3E-06	3.3E-05	2.1E-05
6	0.0E+00	3.0E-05	1.6E-05
6	0.0E+00	1.3E-05	7.9E-06
6	2.7E-06	3.8E-05	2.3E-05
6	1.1E-05	2.5E-05	1.9E-05
6	1.6E-05	1.1E-04	4.0E-05
6	5.4E-06	2.7E-05	1.7E-05

1997 Year-to-Date Results (pCi/m^3)[c]

Location[a,b]	# Samples	Min.	Max.	Avg.
AMS-1B	14	1.3E-04	8.5E-04	4.9E-04
AMS-2	21	5.6E-06	2.5E-04	5.4E-05
AMS-3	21	2.5E-06	6.5E-04	1.8E-04
AMS-4	21	0.0E+00	2.6E-04	3.6E-05
AMS-5	21	0.0E+00	2.2E-04	3.0E-05
AMS-6	21	5.1E-06	1.4E-04	4.7E-05
AMS-7	21	0.0E+00	1.5E-04	3.4E-05
AMS-8A	21	1.1E-05	2.3E-04	8.9E-05
AMS-9B	21	0.0E+00	3.2E-04	1.1E-04
AMS-10	21	0.0E+00	4.5E-05	2.0E-05
AMS-11	21	0.0E+00	3.0E-05	1.2E-05
AMS-12	21	0.0E+00	2.9E-05	7.8E-06
AMS-13	21	0.0E+00	5.1E-05	1.7E-05
AMS-14	21	0.0E+00	3.7E-05	1.8E-05
AMS-16	21	0.0E+00	1.1E-04	1.9E-05
AMS-21	21	0.0E+00	3.2E-05	1.0E-05

Summary of 1996 Results (pCi/m^3)[c]

# Samples	Min.	Max.	Avg.
12	1.6E-04	2.9E-03	8.7E-04
27	0.0E+00	9.4E-04	1.0E-04
27	5.3E-06	7.2E-04	1.7E-04
27	5.3E-06	4.2E-04	6.3E-05
27	5.4E-06	3.7E-04	7.3E-05
27	2.7E-06	5.1E-04	9.1E-05
27	0.0E+00	2.0E-04	2.4E-05
11	1.3E-05	9.0E-04	3.1E-04
11	1.6E-05	7.8E-04	3.1E-04
27	0.0E+00	7.2E-05	2.1E-05
27	0.0E+00	2.2E-04	2.1E-05
27	0.0E+00	3.7E-05	7.7E-06
27	4.5E+00	2.0E-04	2.7E-05
27	0.0E+00	7.5E-05	2.1E-05
27	0.0E+00	6.2E-05	1.1E-05
27	0.0E+00	6.2E-05	1.9E-05

Fenceline Dose Estimate Year-to-Date

(BASED ON LOCATION AMS-3)

Max.	0.16 millirem/ Year-to-Date
Bkgrd	0.014 millirem/ Year-to-Date
Net	**0.15 millirem/ Year-to-Date**

[a] See Figure 3-2

[b] AMS-1B to AMS-9B are on-site/fenceline monitors. AMS-10 to AMS-21 are off-site/background monitors.

[c] For blank corrected concentrations less than or equal to 0.0E+00, the concentration is set at 0.0E+00.

[d] First quarter 1997 sample dates are January 7 to April 1.

[e] Second quarter 1997 sample dates are April 15 to July 8.

[f] Third quarter 1997 sample dates are July 22 to September 30.

[g] NS = Not Sampled

TABLE 3-2

RADIOLOGICAL AIR PARTICULATE - TOTAL SUSPENDED PARTICULATE

First Quarter Results ($\mu g/m^3$)[c,d]

Location[a,b]	# Samples	Min.	Max.	Avg.
AMS-1B	8	24	46	29
AMS-2	8	16	23	20
AMS-3	8	17	29	21
AMS-4	8	14	29	22
AMS-5	8	11	30	21
AMS-6	8	8	30	23
AMS-7	8	25	55	35
AMS-8A	8	18	28	22
AMS-9B	8	7	29	22
AMS-10	0	NA	NA	NA
AMS-11	0	NA	NA	NA
AMS-12	0	NA	NA	NA
AMS-13	0	NA	NA	NA
AMS-14	0	NA	NA	NA
AMS-16	0	NA	NA	NA
AMS-21	0	NA	NA	NA

Second Quarter Results ($\mu g/m^3$)[c,e]

# Samples	Min.	Max.	Avg.
7	28	51	42
7	24	48	34
7	23	80	49
7	24	39	33
7	25	38	31
7	27	47	33
7	32	42	36
7	25	61	40
7	28	104	53
0	NA	NA	NA
0	NA	NA	NA
1	33	33	33
0	NA	NA	NA
0	NA	NA	NA
1	55	55	55
0	NA	NA	NA

Third Quarter Results ($\mu g/m^3$)[c,f]

# Samples	Min.	Max.	Avg.
0	NS	NS	NS
6	29	77	41
6	21	79	47
6	33	47	39
6	25	42	33
6	29	53	36
6	26	51	34
5	33	70	50
6	48	67	55
0	NA	NA	NA
0	NA	NA	NA
6	25	41	32
0	NA	NA	NA
0	NA	NA	NA
6	27	79	54
0	NA	NA	NA

1997 Year-to Date Results ($\mu g/m^3$)[c]

Location[a,b]	# Samples	Min.	Max.	Avg.
AMS-1B	13	24	51	35
AMS-2	21	16	77	31
AMS-3	21	17	80	38
AMS-4	21	14	47	30
AMS-5	21	11	42	28
AMS-6	21	8	53	30
AMS-7	21	25	55	35
AMS-8A	20	18	70	35
AMS-9B	21	7	104	42
AMS-10	0	NA	NA	NA
AMS-11	0	NA	NA	NA
AMS-12	7	25	41	32
AMS-13	0	NA	NA	NA
AMS-14	0	NA	NA	NA
AMS-16	7	27	79	55
AMS-21	0	NA	NA	NA

Summary of 1996 Results ($\mu g/m^3$)[c]

# Samples	Min.	Max.	Avg.
10	26	72	69
20	7	52	28
20	16	56	33
20	19	63	34
20	17	56	33
20	19	56	32
20	18	59	34
11	19	53	31
11	19	51	30
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA
0	NA	NA	NA

[a] See Figure 3-2

[b] AMS-1B to AMS-9B are on-site/fenceline monitors. AMS-10 to AMS-21 are off-site/background monitors.

[c] For blank corrected concentrations less than or equal to 0.0E+00, the concentration is set at 0.0E+00.

[d] First quarter 1997 sample dates are January 7 to April 1.

[e] Second quarter 1997 sample dates are April 15 to July 8.

[f] Third quarter 1997 sample dates are July 22 to September 30.

[g] NS = Not Sampled

TABLE 3-3

RADON MONITORING-ALPHA TRACK-ETCH CUPS, CONCENTRATION DATA FOR FIRST HALF 1997

Location	Radon Concentration ± Precision[a] (pCi/L)		
	1st Half of Year 1997	1st Half of Year 1996	1996 Location Average
K65 Silo			
K65A	0.9 ± 0.4	1.0 ± 0.3	1.6 ± 0.5
K65B	1.3 ± 0.6	1.4 ± 0.1	2.0 ± 0.1
K65C	2.0 ± 0.6	1.8 ± 0.4	2.5 ± 0.9
K65D	2.8 ± 0.6	2.5 ± 0.4	3.9 ± 1.1
K65E	2.9 ± 0.4	2.4 ± 0.7	3.5 ± 0.9
K65F	2.7 ± 0.7	2.2 ± 0.4	3.9 ± 0.8
K65G	1.7 ± 0.5	1.3 ± 0.3	2.2 ± 0.6
K65H	1.1 ± 0.3	0.9 ± 0.2	1.6 ± 0.6
K65I	0.8 ± 0.4	0.7 ± 0.1	1.4 ± 0.4
K65J	0.5 ± 0.2	0.7 ± 0.2	1.2 ± 0.4
K65K	0.8 ± 0.1	0.9± 0.5	1.3 ± 0.5
K65L	1.7 ± 0.9	1.4 ± 0.2	2.0 ± 0.5
K65M	1.6 ± 0.6	1.4 ± 0.3	1.9 ± 0.4
K65N	1.2 ± 0.4	1.1 ± 0.4	1.8 ± 0.6
K65O	0.7 ± 0.2	0.8 ± 0.4	1.4 ± 0.6
K65P	0.6 ± 0.5	0.8 ± 0.2	1.4 ± 0.4
SILO1-NE	12.3 ± 0.3	10.3 ± 5.3	11.4 ± 5.5
SILO1-NW	6.5 ± 0.9	4.0 ± 0.1	7.8 ± 1.1
SILO1-SE	6.0 ± 0.9	4.7 ± 0.4	7.0 ± 0.4
SILO1-SW	3.2± 0.4	2.9 ± 1.4	4.1 ± 1.5
SILO2-NE	18.3 ± 0.1	22.2 ± 14.8	27.6 ± 14.9
SILO2-NW	4.0 ± 0.7	11.8 ± 0.6	9.7 ± 1.1
SILO2-SE	12.1 ± 1.3	11.5 ± 0.9	13.8 ± 2.6
SILO2-SW	7.4 ± 0.6	6.5 ± 1.4	8.0 ± 1.4
Min.	**0.5 ± 0.2**	**0.7 ± 0.1**	**1.2 ± 0.4**
Max.	**18.3 ± 0.1**	**22.2 ± 14.8**	**27.6 ± 14.9**
Avg.	**3.9 ± 2.9**	**1.3 ± 15.9**	**1.6 ± 16.5**
Fenceline			
AMS-02	0.1 ± 0.1	0.4 ± 0.1	0.7 ± 0.2
AMS-04	0.1 ± 0.2	0.3 ± 0.2	0.6 ± 0.2
AMS-06	0.1 ± 0.2	0.4 ± 0.2	0.9 ± 0.5
AMS-07	0.1 ± 0.2	0.5 ± 0.2	0.8 ± 0.2
AMS-08A	0.0 ± 0.1	Moved[b]	0.8 ± 0.2
AMS-09B	0.2 ± 0.1	Moved[b]	0.8 ± 0.4
FEMP-A	0.4 ± 0.2	0.9 ± 0.2	1.0 ± 0.2
FEMP-B	0.3 ± 0.2	0.6 ± 0.2	0.8 ± 0.3
FEMP-C	0.1 ± 0.2	0.6 ± 0.2	0.7 ± 0.2
FEMP-D	0.1 ± 0.2	0.3 ± 0.1	0.6 ± 0.2
FEMP-E	0.1 ± 0.2	0.4 ± 0.1	0.6 ± 0.4
FEMP-F	0.1 ± 0.1	0.3 ± 0.1	0.7 ± 0.2
FEMP-G	0.1 ± 0.1	0.4 ± 0.3	0.8 ± 0.4
FEMP-H	0.1 ± 0.2	0.4 ± 0.2	0.8 ± 0.2

000097

TABLE 3-3
(Continued)

Location	Radon Concentration ± Precision[a] (pCi/L) 1st Half of Year 1997	1st Half of Year 1996	1996 Location Average
Fenceline (Continued)			
FEMP-I	0.2 ± 0.1	0.4 ± 0.0	0.8 ± 0.3
FEMP-J	0.1 ± 0.1	0.4 ± 0.1	0.7 ± 0.1
FEMP-K	0.2 ± 0.1	0.4 ± 0.1	0.8 ± 0.3
FEMP-L	0.2 ± 0.1	0.4 ± 0.1	0.9 ± 0.3
FEMP-M	0.2 ± 0.2	0.4 ± 0.3	0.8 ± 0.4
FEMP-N	0.2 ± 0.2	0.4 ± 0.0	0.7 ± 0.2
FEMP-O	0.0 ± 0.2	0.4 ± 0.1	0.9 ± 0.2
FEMP-P	0.2 ± 0.2	0.5 ± 0.0	0.8 ± 0.3
Min.	**0.0 ± 0.1**	**0.3 ± 0.1**	**0.6 ± 0.2**
Max.	**0.4 ± 0.2**	**0.9 ± 0.2**	**1.0 ± 0.2**
Avg.	**0.1 ± 0.8**	**0.4 ± 0.7**	**0.8 ± 1.3**
Background			
AMS-12	0.0 ± 0.1	0.5 ± 0.2	0.9 ± 0.5
AMS-13	0.1 ± 0.2	0.5 ± 0.1	0.7 ± 0.2
AMS-16[c]	0.0 ± NA[d]	0.4 ± 0.1	0.6 ± 0.3
BKGD-01	0.0 ± NA[d]	0.3 ± 0.1	0.5 ± 0.1
BKGD-02	0.0 ± 0.1	0.3 ± 0.1	0.6 ± 0.2
BKGD-04	0.1 ± 0.2	0.2 ± 0.2	0.5 ± 0.3
BKGD-05	0.0 ± 0.1	0.3 ± 0.1	0.6 ± 0.1
BKGD-06	0.0 ± NA[e]	0.4 ± 0.2	0.6 ± 0.2
Min.	**0.0 ± 0.1**	**0.2 ± 0.2**	**0.5 ± 0.1**
Max.	**0.1 ± 0.2**	**0.5 ± 0.2**	**0.9 ± 0.5**
Avg.	**0.1 ± 0.3**	**0.4 ± 0.4**	**0.6 ± 0.8**
Other			
PERM-07	0.1 ± 0.1	0.5 ± 0.1	0.8 ± 0.2
PERM-09	0.0 ± 0.1	0.5 ± 0.3	0.8 ± 0.6
BLDG-65-6	0.2 ± 0.2	0.4 ± 0.1	0.6 ± 0.3
BLDG-65-7	0.3 ± 0.1	1.5 ± 0.2	2.2 ± 0.3
BLDG-65-8	0.3 ± 0.1	Unavailable[e]	Unavailable[e]
BLDG-65-9	Unavailable[e]	7.7 ± 1.3	7.7 ± 1.3
AMS-01A	0.1 ± 0.1	0.6 ± 0.3	0.8 ± 0.4
AMS-10	0.1 ± 0.2	0.5 ± 0.4	0.8 ± 0.5
AMS-11	0.0 ± 0.1	0.6 ± 0.2	1.0 ± 0.4
RES-01	0.0 ± 0.1	0.5 ± 0.1	0.8 ± 0.2
RES-02	0.0 ± 0.1	0.5 ± 0.2	0.8 ± 0.4
RES-03	0.1 ± 0.2	0.5 ± 0.3	0.9 ± 0.6
Min.	**0.0 ± 0.1**	**0.4 ± 0.1**	**0.6 ± 0.3**
Max.	**0.3 ± 0.1**	**7.7 ± 1.3**	**7.7 ± 1.3**
Avg.	**0.1 ± 0.4**	**0.3 ± 1.5**	**0.5 ± 1.8**

[a] ±2 standard deviations
[b] Moved mid-year to fenceline location
[c] Previously referred to as BKGD-03
[d] For laboratory bias correction factors greater than the exposure value, with associated precision values that do not encompass a positive concentration, the resulting negative corrected concentration is set at 0.0 and the associated precision is not applicable (NA).
[e] Data unavailable due to damage to the monitoring device.

TABLE 3-4

DIRECT RADIATION (TLD) MEASUREMENTS

TLD Location #	Direct Radiation ± Uncertainty[a] (mrem) 1st Quarter 1997	2nd Quarter 1997	3rd Quarter 1997	Year-to-Date 1997	1996
Fenceline					
2	17 ± 1.3	18 ± 2.3	19 ± 3.1	54 ± 6.7	73 ± 7.0
3	15 ± 1.1	16 ± 2.0	17 ± 2.8	48 ± 6.0	67 ± 6.4
4	15 ± 1.1	18 ± 2.2	17 ± 2.8	49 ± 6.1	64 ± 6.1
5	15 ± 1.1	17 ± 2.1	17 ± 2.9	50 ± 6.1	67 ± 6.5
6	18 ± 1.4	20 ± 2.5	21 ± 3.5	59 ± 7.3	75 ± 7.2
7	15 ± 1.1	17 ± 2.1	17 ± 2.8	49 ± 6.0	67 ± 6.5
8A	17 ± 1.3	19 ± 2.4	19 ± 3.2	55 ± 6.8	77 ± 7.5
9B	18 ± 1.3	22 ± 2.7	20 ± 3.3	60 ± 7.4	83 ± 8.0
13	17 ± 1.3	18 ± 2.3	18 ± 3.0	53 ± 6.6	71 ± 6.9
14	16 ± 1.2	18 ± 2.2	18 ± 2.9	52 ± 6.4	71 ± 6.9
15	17 ± 1.3	18 ± 2.3	20 ± 3.3	55 ± 6.8	73 ± 7.0
16	17 ± 1.3	20 ± 2.5	20 ± 3.3	57 ± 7.0	78 ± 7.5
17	15 ± 1.1	18 ± 2.2	19 ± 3.1	51 ± 6.3	70 ± 6.8
Min.	**15 ± 1.1**	**16 ± 2.0**	**17 ± 2.8**	**48 ± 6.0**	**64 ± 6.1**
Max.	**18 ± 1.4**	**22 ± 2.7**	**21 ± 3.5**	**60 ± 7.4[b]**	**83 ± 8.0**
Avg.	**17 ± 4.4**	**18 ± 8.3**	**19 ± 11**	**54 ± 24**	**72 ± 25**
Onsite					
1A	20 ± 1.5	22 ± 2.7	21 ± 3.5	63 ± 7.7	140 ± 14
22	204 ± 15	163 ± 20	177 ± 29	545 ± 67	630 ± 60
23	157 ± 12	169 ± 21	172 ± 29	498 ± 61	630 ± 61
24	111 ± 8.3	119 ± 15	133 ± 22	362 ± 45	460 ± 44
25	157 ± 12	134 ± 17	151 ± 25	441 ± 54	560 ± 54
26	97 ± 7.3	85 ± 11	113 ± 19	295± 36	330 ± 32
32	13 ± 1.0	15 ± 1.8	13 ± 2.2	41 ± 5.0	55 ± 5.4
Min.	**13 ± 1.0**	**15 ± 1.8**	**13 ± 2.2**	**41 ± 5.0**	**55 ± 5.4**
Max.	**204 ± 15**	**169 ± 21**	**177 ± 29**	**545 ± 67**	**630 ± 61**
Avg.	**109 ± 25**	**101 ± 38**	**111 ± 56**	**321 ± 121**	**401 ± 116**
Offsite					
10	12 ± 0.9	14 ± 1.7	13 ± 2.2	39 ± 4.8	55 ± 5.3
11	15 ± 1.2	17 ± 2.1	17 ± 2.8	49 ± 6.0	67 ± 6.5
12	14 ± 1.0	16 ± 2.0	15 ± 2.5	45 ± 5.5	60 ± 5.8
30	14 ± 1.0	16 ± 2.0	14 ± 2.4	44 ± 5.5	60 ± 5.8
Min.	**12 ± 0.9**	**14 ± 1.7**	**13 ± 2.2**	**39 ± 4.8**	**55 ± 5.3**
Max.	**15 ± 1.2**	**17 ± 2.1**	**17 ± 2.8**	**49 ± 6.0**	**67 ± 6.5**
Avg.	**14 ± 2.1**	**16 ± 3.9**	**15 ± 4.9**	**45 ± 11**	**61 ± 12**
Background					
18	16 ± 1.2	19 ± 2.4	19 ± 3.2	54 ± 6.7	74 ± 7.2
19	14 ± 1.0	16 ± 2.0	15 ± 2.6	45 ± 5.6	63 ± 6.0
20	13 ± 1.0	15 ± 1.8	15 ± 2.4	43 ± 5.2	59 ± 5.7
21	15 ± 1.1	17 ± 2.2	18 ± 3.0	51 ± 6.2	68 ± 6.8
27	14 ± 1.1	16 ± 2.0	15 ± 2.5	45 ± 5.5	62 ± 5.9
33	16 ± 1.2	17 ± 2.1	16 ± 2.7	49 ± 6.0	69 ± 6.7
Min.	**13 ± 1.0**	**15 ± 1.8**	**15 ± 2.4**	**43 ± 5.2**	**59 ± 5.7**
Max.	**16 ± 1.2**	**19 ± 2.4**	**19 ± 3.2**	**54 ± 6.7**	**74 ± 7.2**
Avg.	**15 ± 2.7**	**17 ± 5.1**	**16 ± 6.7**	**48 ± 14[b]**	**66 ± 16**

[a]Associated laboratory uncertainty
[b]A comparison of the maximum fenceline year-to-date 1997 dose to the average background year-to-date 1997 dose yields no statistical difference when considering the overlap of the uncertainties.

TABLE 3-5

NESHAP STACK EMISSION MONITORING RESULTS

Analysis Performed	First Quarter Results[a]		Second Quarter Results[b]		Third Quarter Results[c]		1997 Year-to-Date Results		Summary of 1996 Results[d]	
	No. of Samples	Total Pounds	No. of Samples	Total Pounds	No. of Samples	Total Pounds	No. of Samples	Total Pounds	No. of Samples	Total Pounds
Building 71										
Uranium, Total	2	1.6E-05	3	2.4E-05	3	2.6E-05	8	6.6E-05	NA	NA
Thorium-232	2	2.2E-05	3	4.5E-05	3	5.2E-05	8	1.2E-04	NA	NA
Thorium-230	2	1.8E-10	3	3.4E-10	3	4.9E-10	8	1.0E-09	NA	NA
Total Particulate	2	1.0E-02	3	0.0E+00	3	0.0E+00	8	1.0E-02	NA	NA
Laboratory Stack										
Uranium, Total	1	3.7E-05	1	3.9E-05	1	3.8E-05	3	1.1E-04	5	3.0E-04
Thorium-232	1	5.9E-05	1	8.7E-05	1	1.7E-04	3	3.2E-04	NS	NS
Thorium-230	1	5.8E-10	1	7.0E-10	1	9.0E-10	3	2.2E-09	5	3.0E-09
Total Particulate	1	2.5E-01	1	3.9E-01	1	2.2E-01	3	8.6E-01	5	3.0E+00
Laundry Stack										
Uranium, Total	2	5.6E-05	2	5.6E-05	2	2.4E-04	6	3.5E-04	7	1.3E-04
Thorium-232	2	8.5E-05	2	1.1E-04	2	1.0E-04	6	3.0E-04	NS	NS
Thorium-230	2	6.8E-10	2	2.6E-09	2	7.3E-10	6	4.0E-09	7	3.9E-09
Total Particulate	2	1.4E-01	2	2.3E-01	2	1.9E-01	6	5.6E-01	7	1.3E+00
Trash Compactor										
Uranium, Total	479	7.3E-07	498	1.1E-06	274	7.0E-07	1251	2.5E-06	1921	3.6E-04
Total Particulate	13	7.1E-04	13	1.6E-03	6	5.5E-04	32	2.9E-03	51	6.8E-03

[a]First quarter 1997 sample dates are:
For Building 71 - January 3 to April 9
For the Laboratory Stack - December 31, 1996 to April 3
For the Laundry Stack - December 31, 1996 to April 3
For the Trash Compactor - January 1, 1997 to March 31 for Total Uranium
For the Trash Compactor - December 27, 1996 to April 3 for Total Particulate.

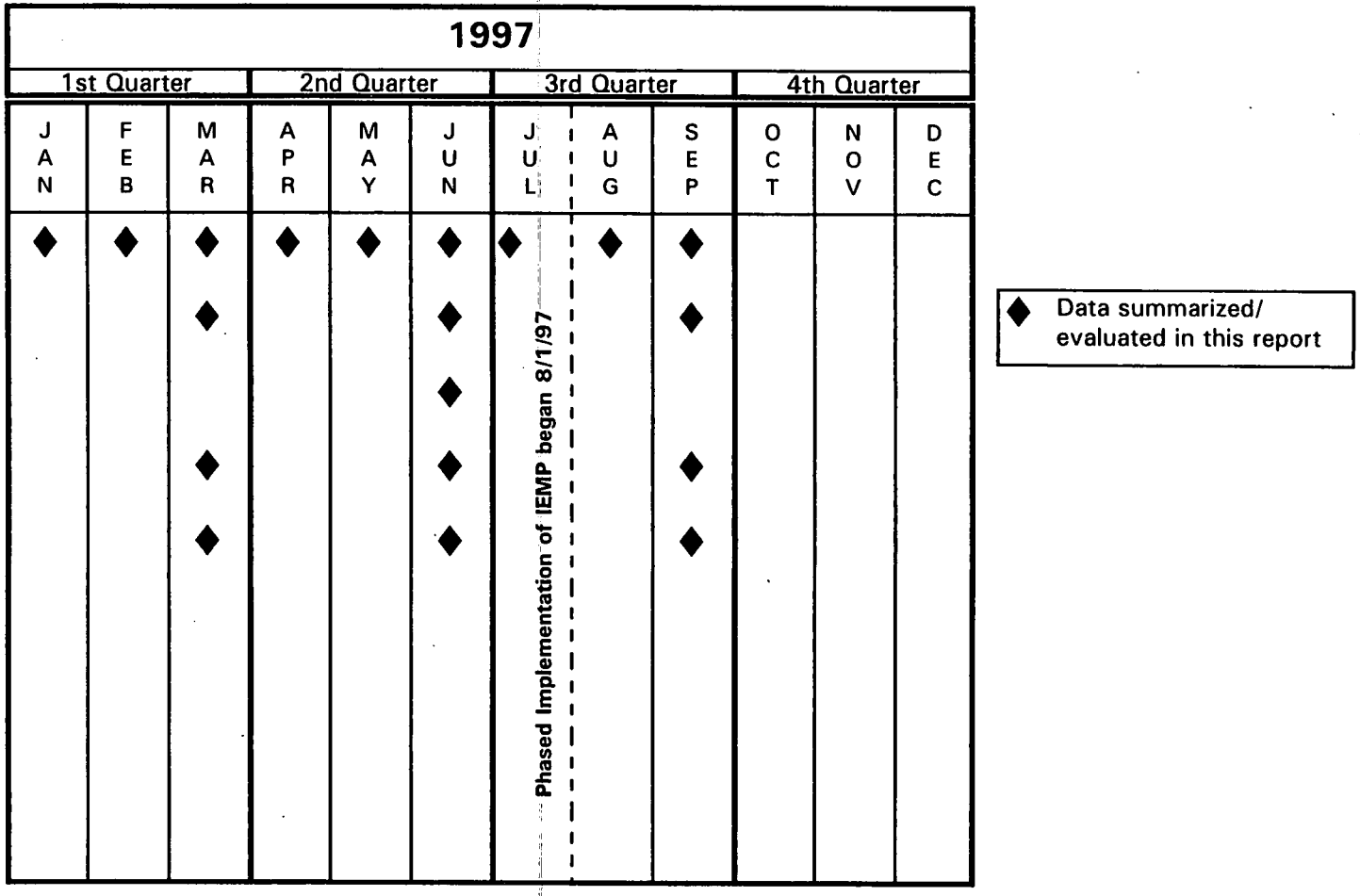
[b]Second quarter 1997 sample dates are:
For Building 71 - April 9 to July 10
For the Laboratory Stack - April 3 to July 22
For the Laundry Stack - April 3 to July 9
For the Trash Compactor - April 1 to June 30 for Total Uranium
For the Trash Compactor - April 3 to July 3 for Total Particulate.

[c]Third quarter 1997 sample dates are:
For Building 71 - July 10 to October 7
For the Laboratory Stack - July 22 to October 7
For the Laundry Stack - July 9 to October 7
For the Trash Compactor - June 30 to August 19 for Total Uranium
For the Trash Compactor - July 3 to August 13 for Total Particulate.

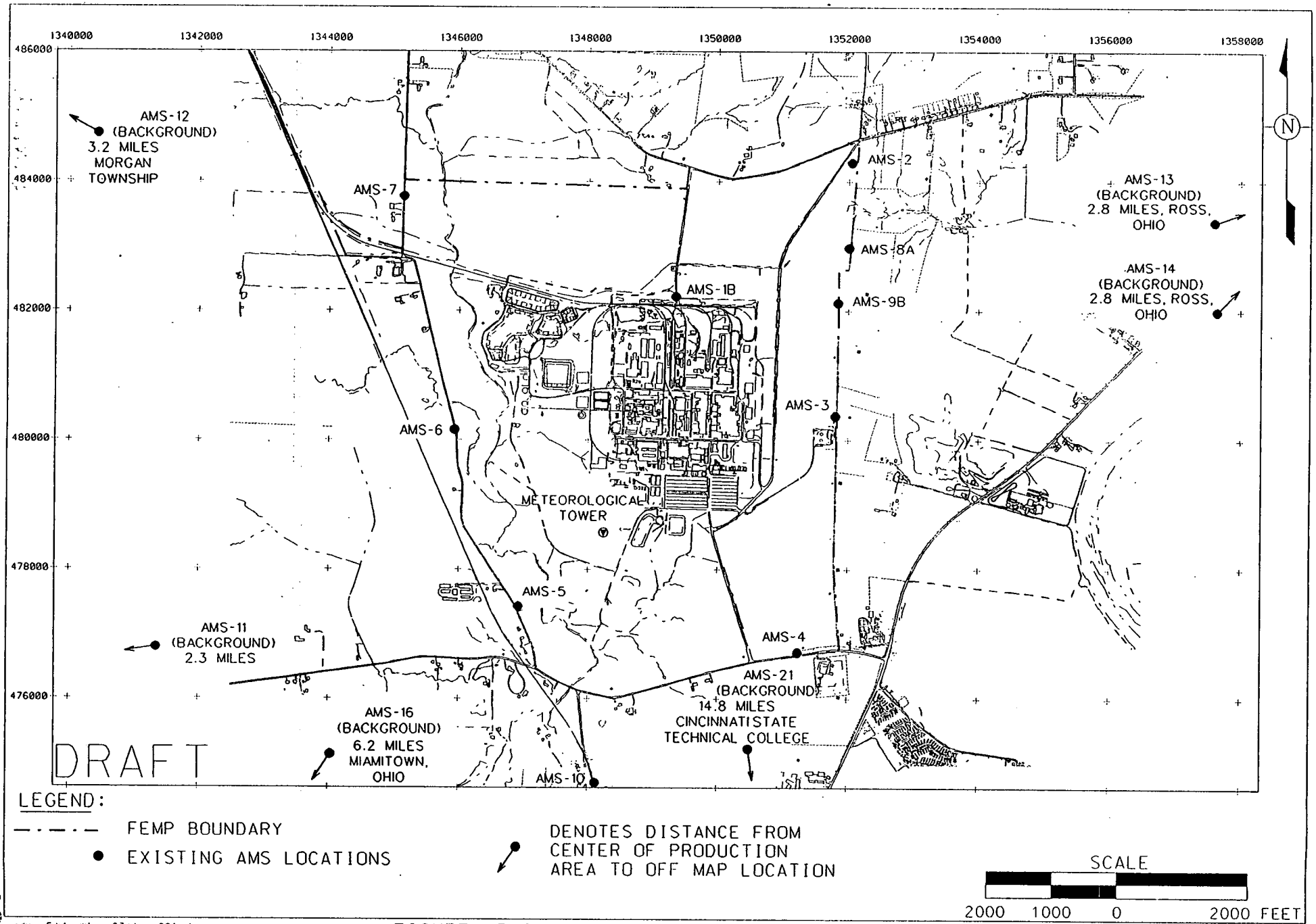
[d]NA = Not Applicable
NS = Not Sampled

FIGURE 3-1

AIR SAMPLING ACTIVITIES COVERED IN THIS REPORT



[a] Biweekly results
[b] Reported to EPA and OEPA in the quarterly FFCA reports



v:*cru5*dgn*iemp83*iemp001.dgn
STATE PLANAR COORDINATE SYSTEM 1983

05-DEC-1997

FIGURE 3-2. PRE-IEMP RADIOLOGICAL AIR PARTICULATE MONITORING LOCATIONS

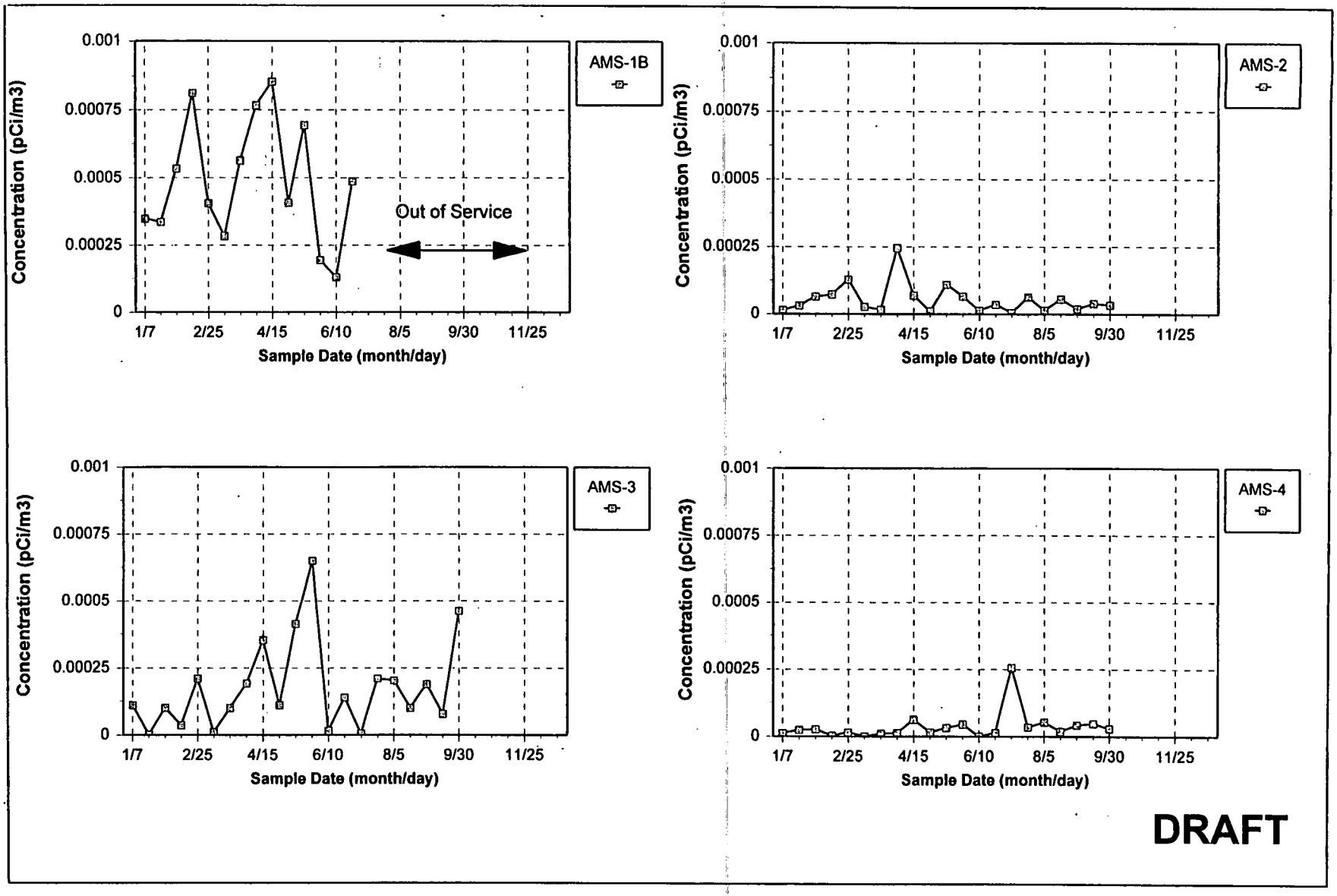


FIGURE 3-3. RADIOLOGICAL AIR PARTICULATE TOTAL URANIUM CONCENTRATIONS (AMS-1B, AMS-2, AMS-3, AND AMS-4)

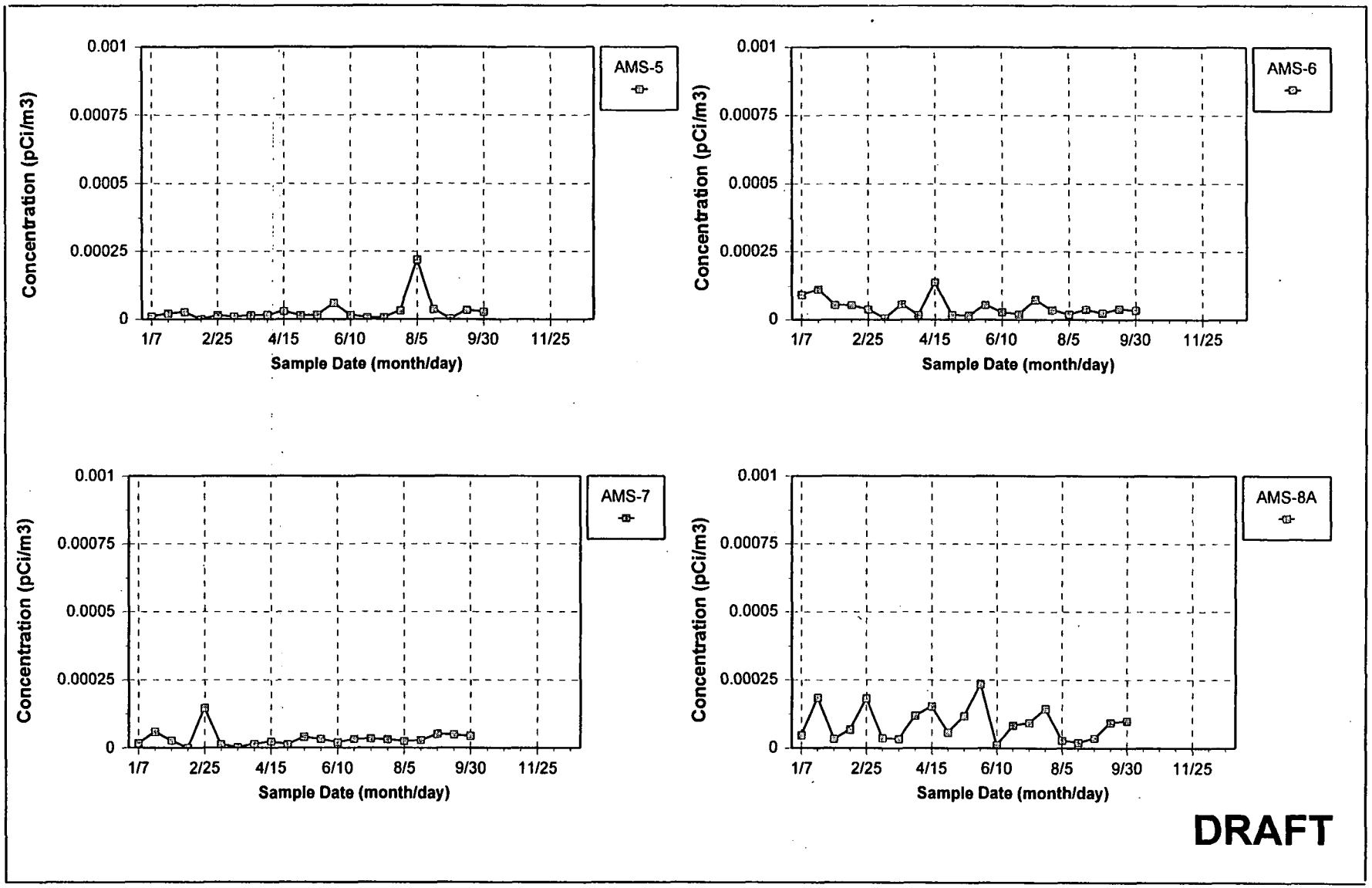


FIGURE 3-4. RADIOLOGICAL AIR PARTICULATE TOTAL URANIUM CONCENTRATIONS (AMS-5, AMS-6, AMS-7, AND AMS-8A)

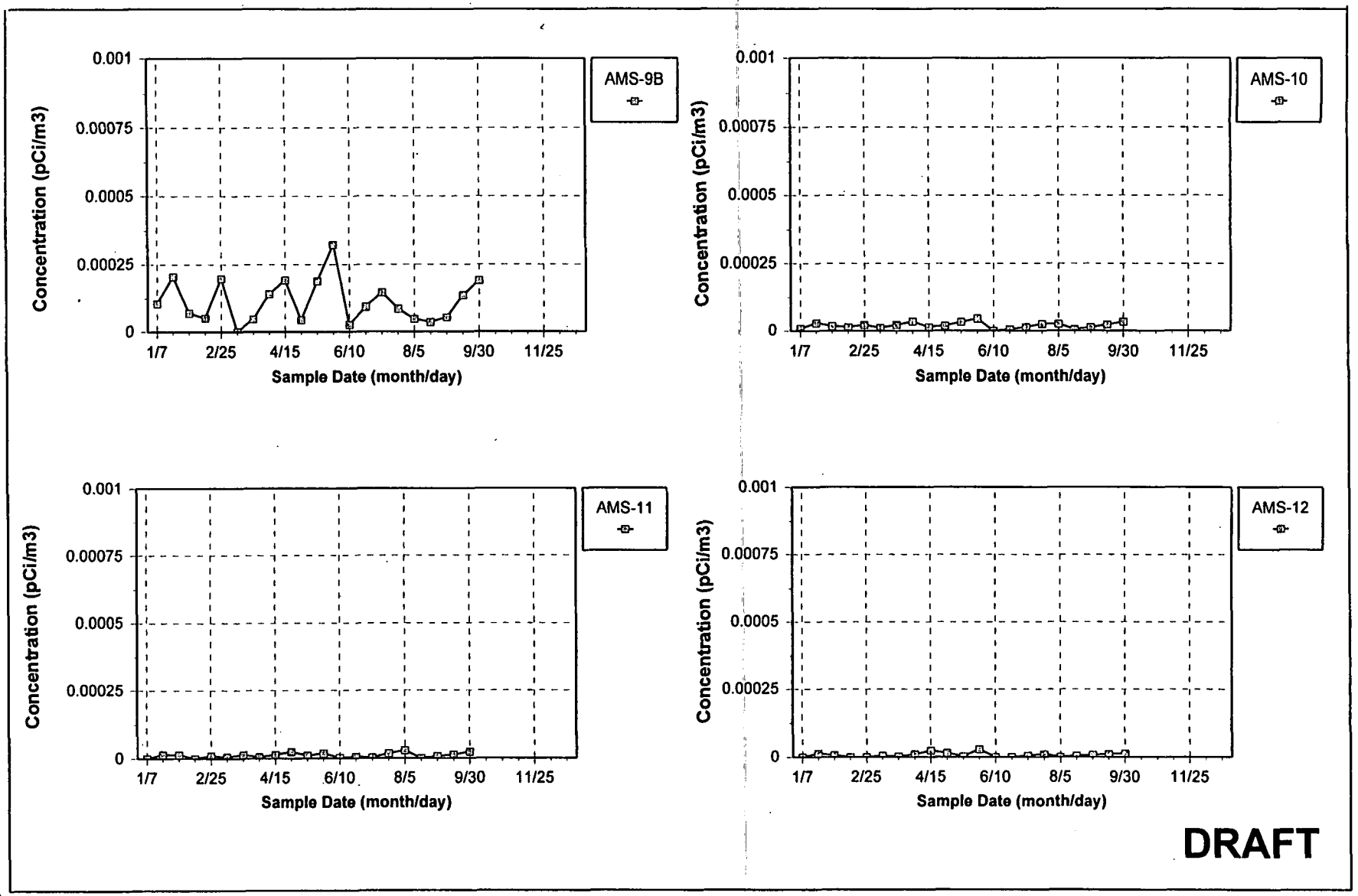


FIGURE 3-5. RADIOLOGICAL AIR PARTICULATE TOTAL URANIUM CONCENTRATIONS (AMS-9B, AMS-10, AMS-11, AND AMS-12)

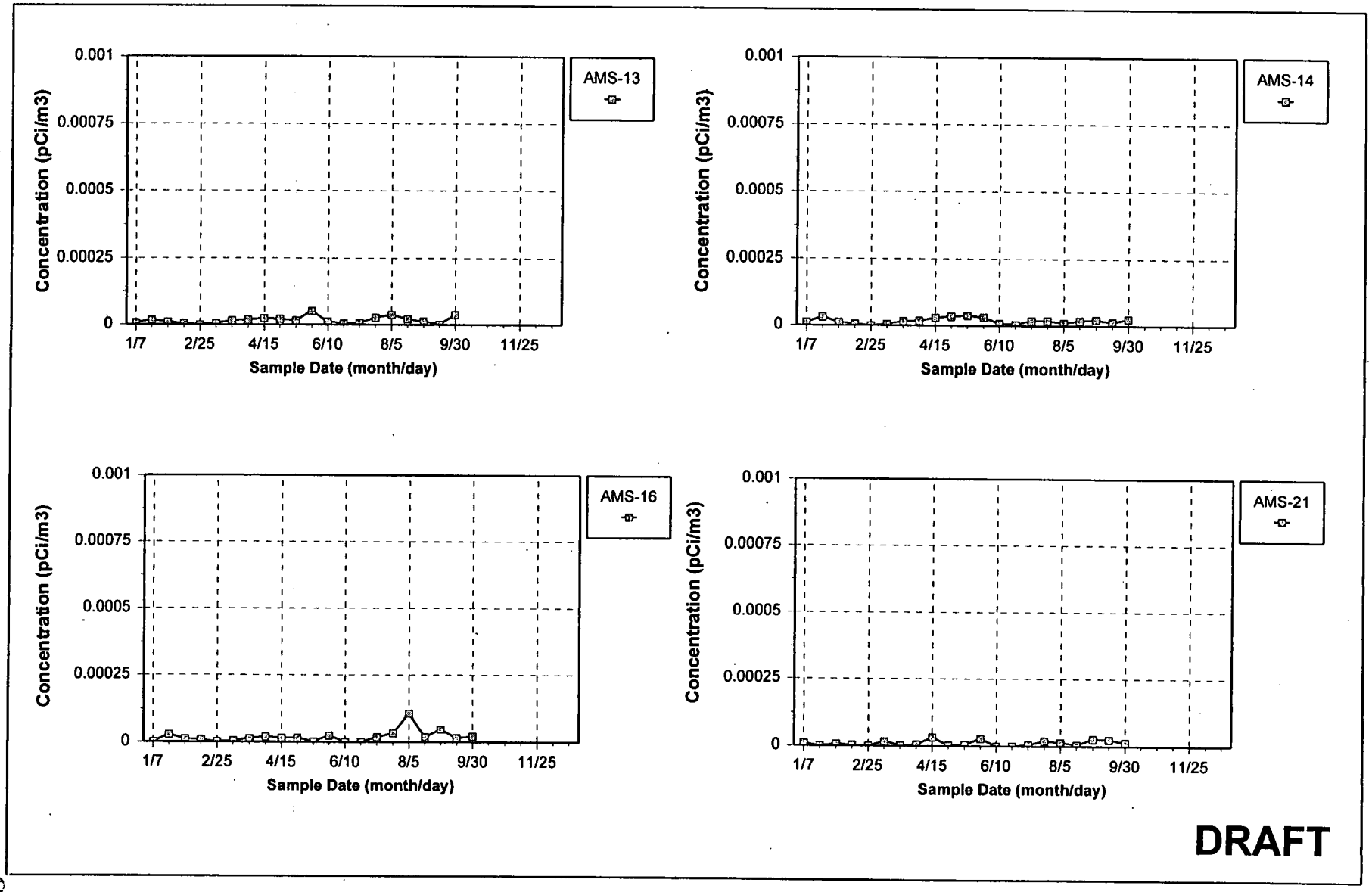


FIGURE 3-6. RADIOLOGICAL AIR PARTICULATE TOTAL URANIUM CONCENTRATIONS (AMS-13, AMS-14, AMS-16, AND AMS-21)

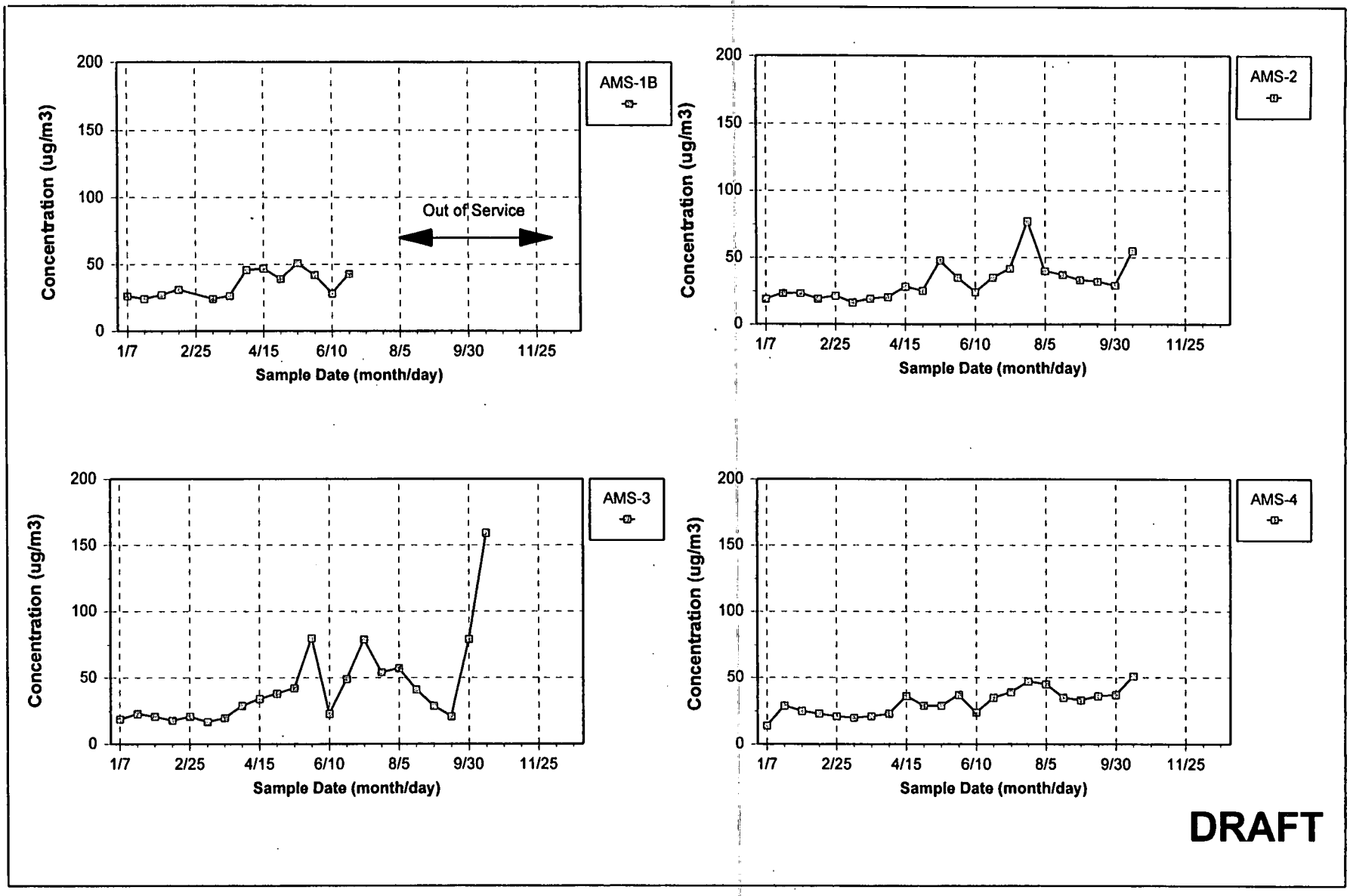


FIGURE 3-7. RADIOLOGICAL TOTAL SUSPENDED PARTICULATE CONCENTRATIONS (AMS-1B, AMS-2, AMS-3, AND AMS-4)

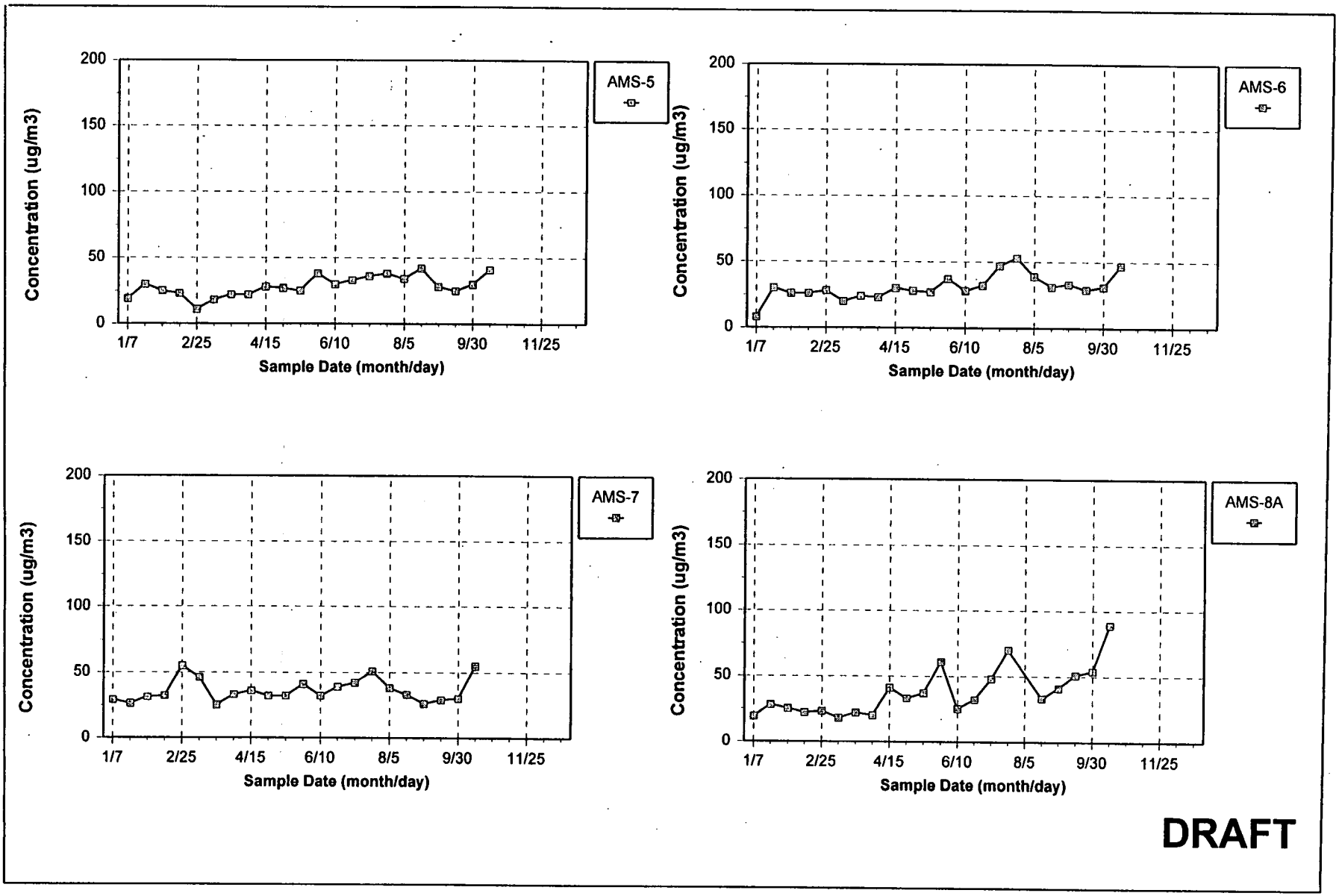


FIGURE 3-8. RADIOLOGICAL TOTAL SUSPENDED PARTICULATE CONCENTRATIONS (AMS-5, AMS-6, AMS-7, AND AMS-8A)

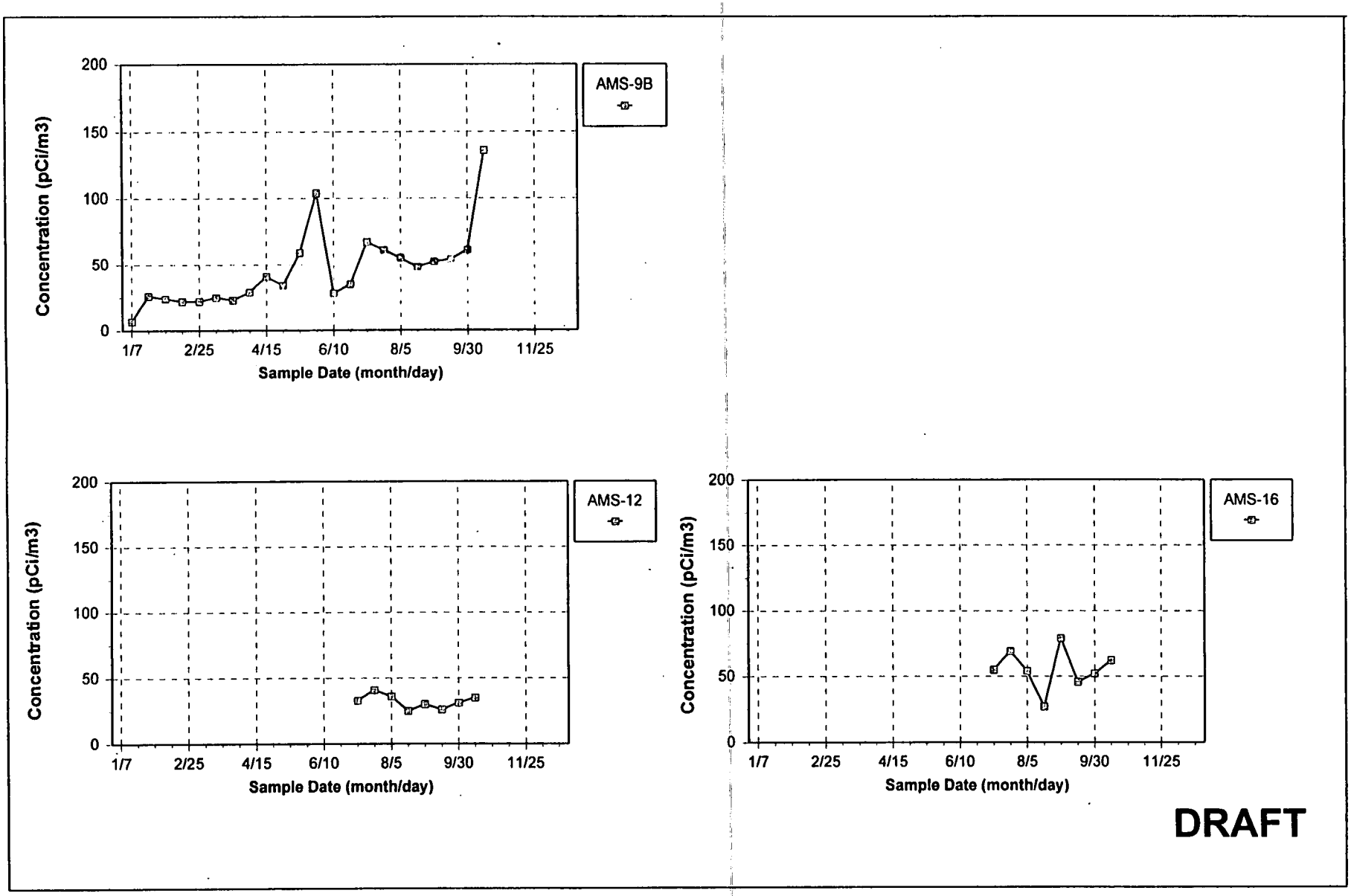
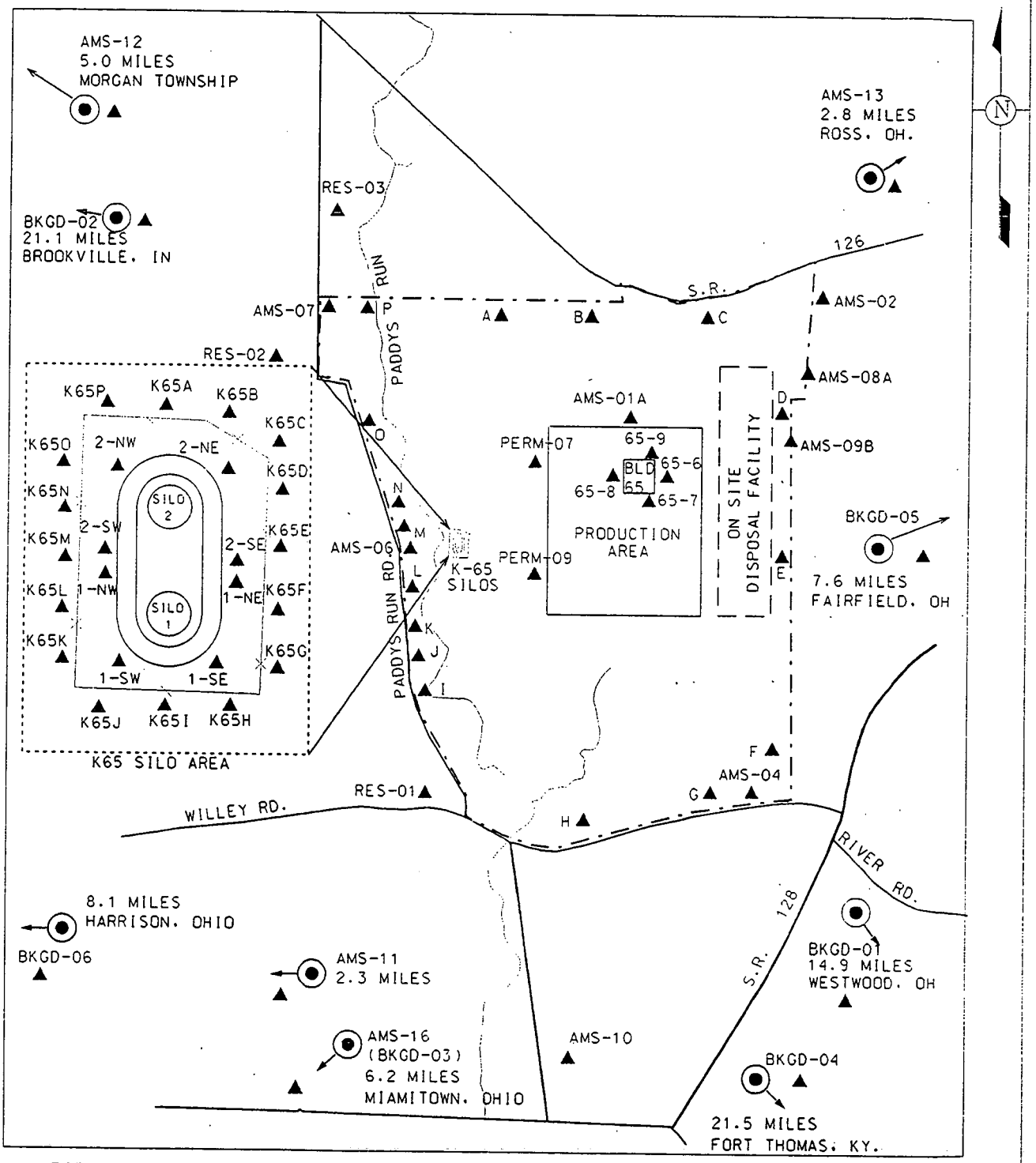


FIGURE 3-9. RADIOLOGICAL TOTAL SUSPENDED PARTICULATE CONCENTRATIONS (AMS-9B, AMS-12, AND AMS-16)



LEGEND:

- FEMP BOUNDARY
- ▲ RADON MONITORING-ALPHA TRACK-ETCH CUP MONITORING LOCATION
- DISTANCE FROM CENTER OF PRODUCTION AREA TO LOCATION OFF THE MAP

NOTE:
LOCATIONS A THRU P HAVE THE PREFIX 'FEMP' IN TABLE 3-3.

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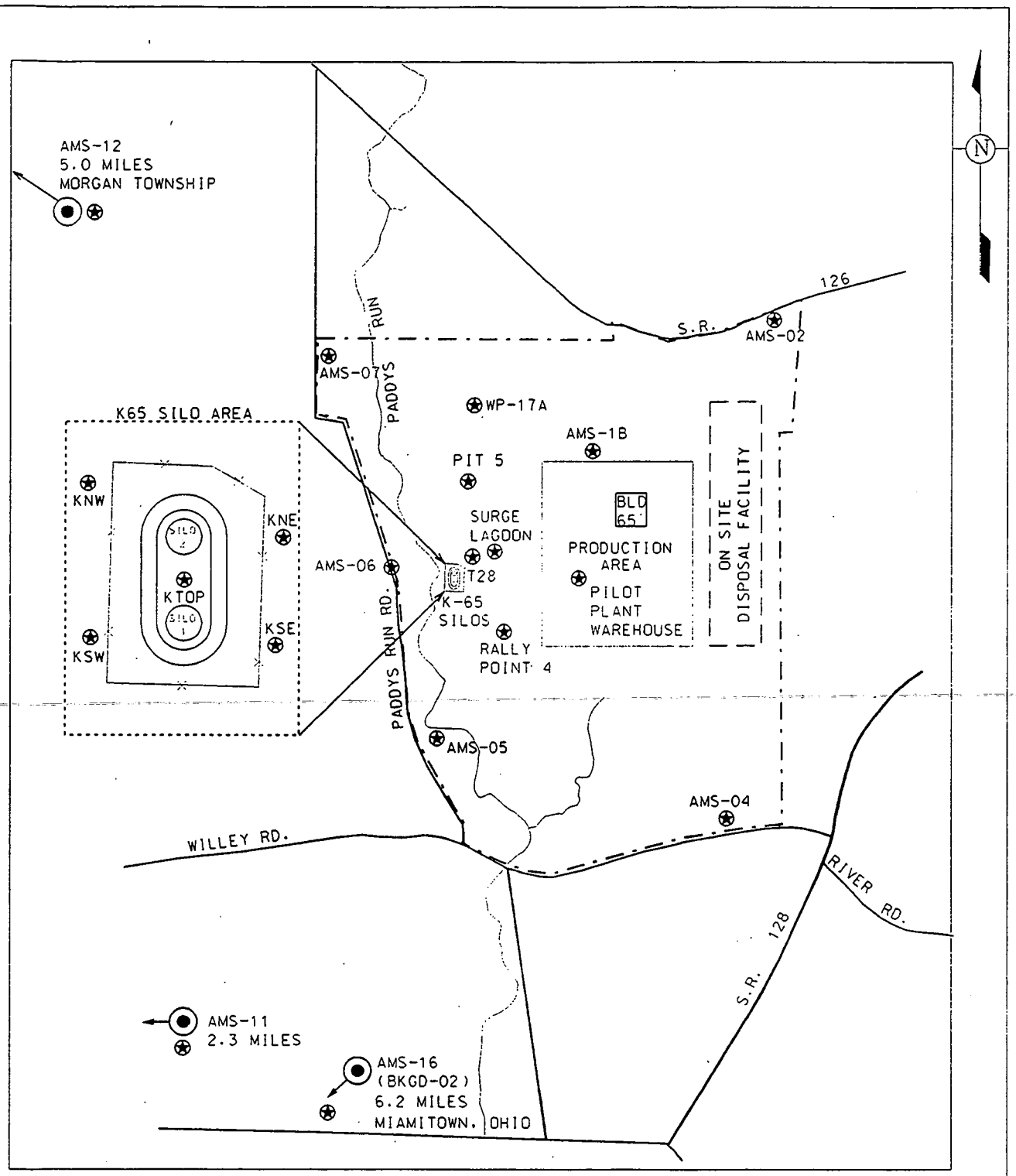
NOT TO SCALE

FIGURE 3-10. RADON MONITORING-ALPHA TRACK-ETCH CUP LOCATIONS



LEGEND:

FEMP BOUNDARY

RADON MONITORING-CONTINUOUS ALPHA SCINTILLATION LOCATION

DISTANCE FROM CENTER OF PRODUCTION AREA TO LOCATION OFF THE MAP

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NOT TO SCALE

FIGURE 3-11. RADON MONITORING-CONTINUOUS ALPHA SCINTILLATION LOCATIONS

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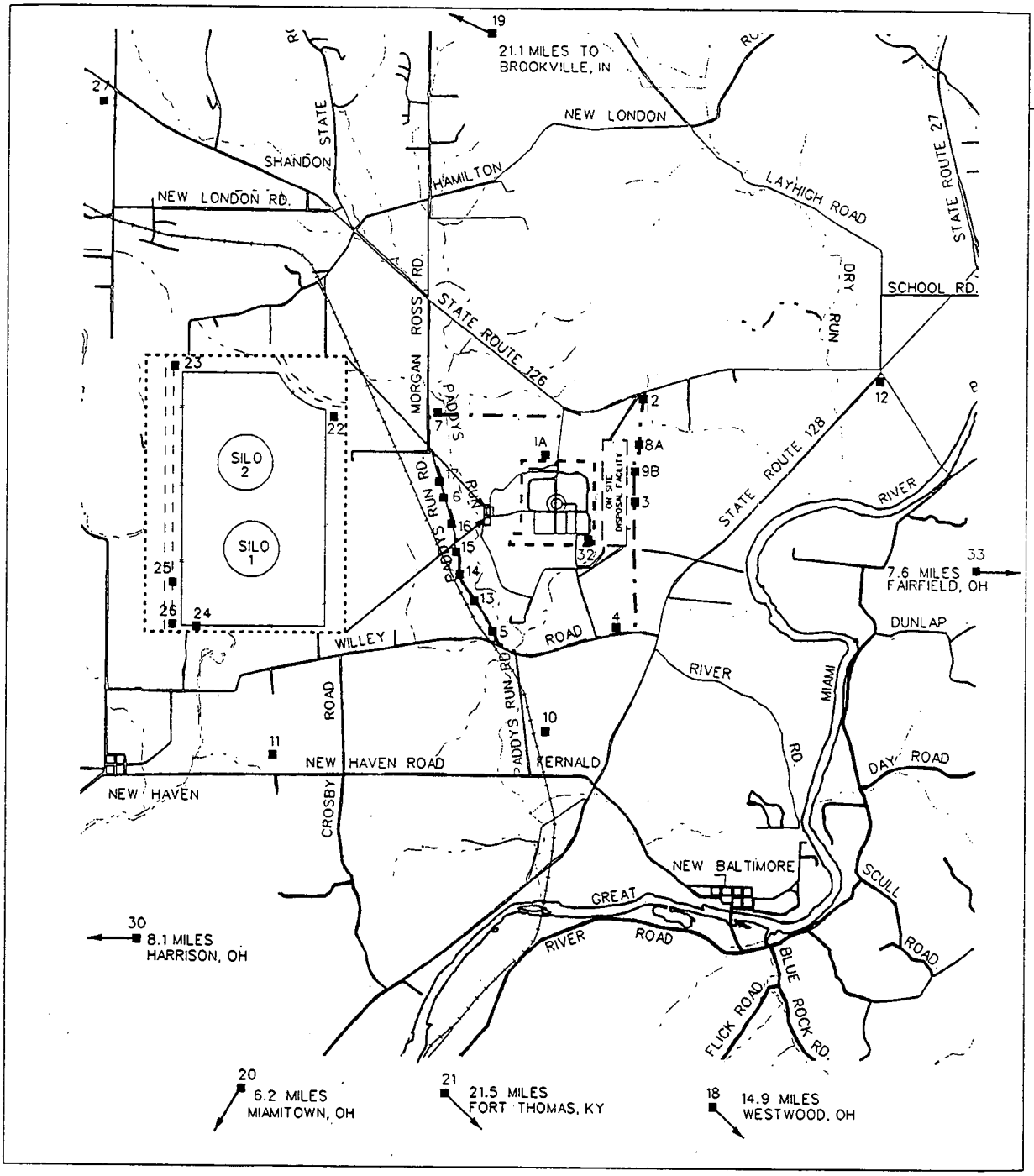
STATE PLANAR COORDINATE SYSTEM 1983

18-NOV-1997



LEGEND:

- DISTANCE FROM CENTER OF PRODUCTION AREA TO SAMPLING LOCATIONS OFF MAP
- DIRECT RADIATION (TLD) MONITORING LOCATION
- FEMP BOUNDARY
- PRODUCTION AREA BOUNDARY

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SCALE

1 1/2 0 1 MILE

FIGURE 3-12. DIRECT RADIATION (TLD) MONITORING LOCATIONS

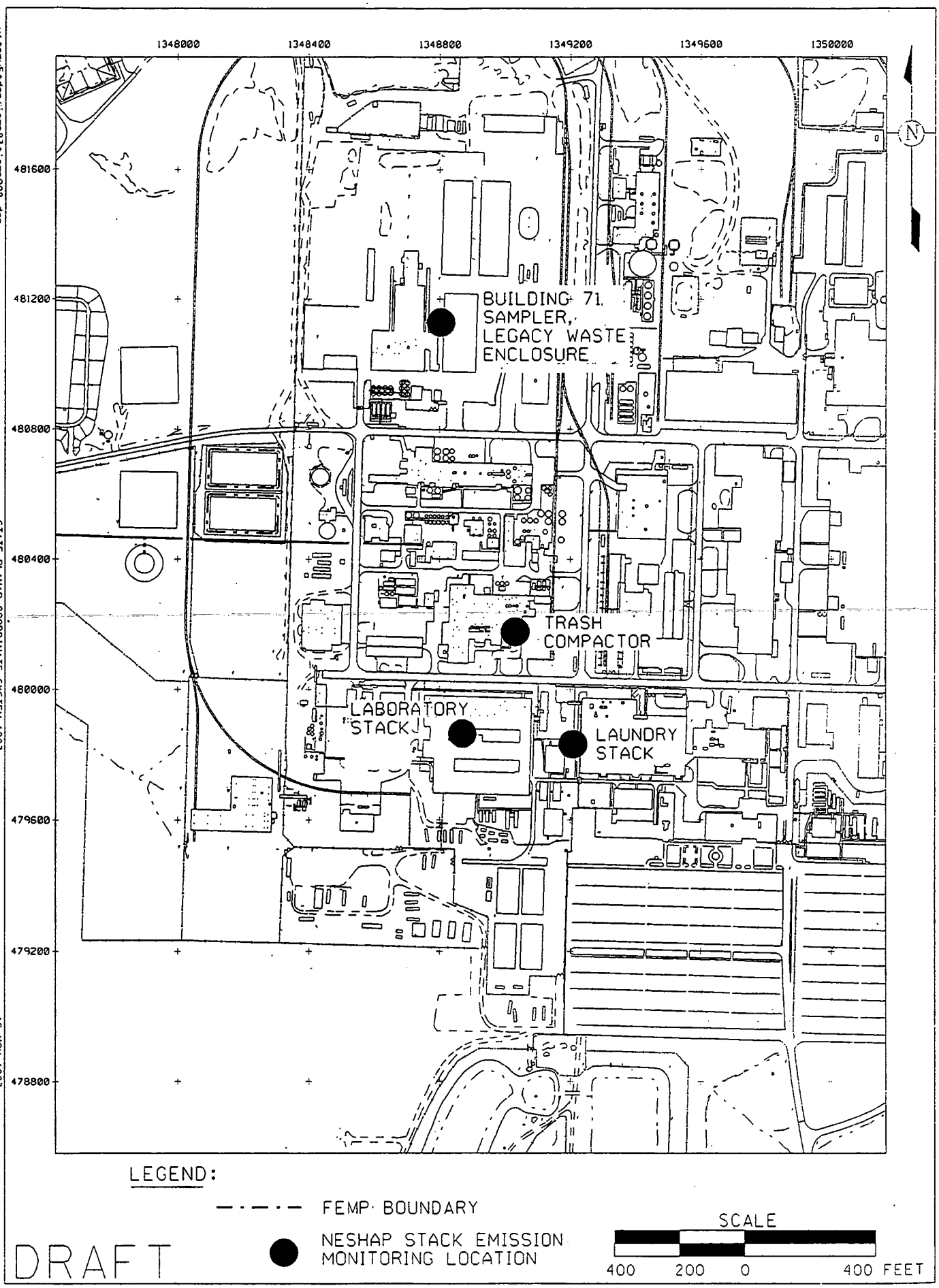
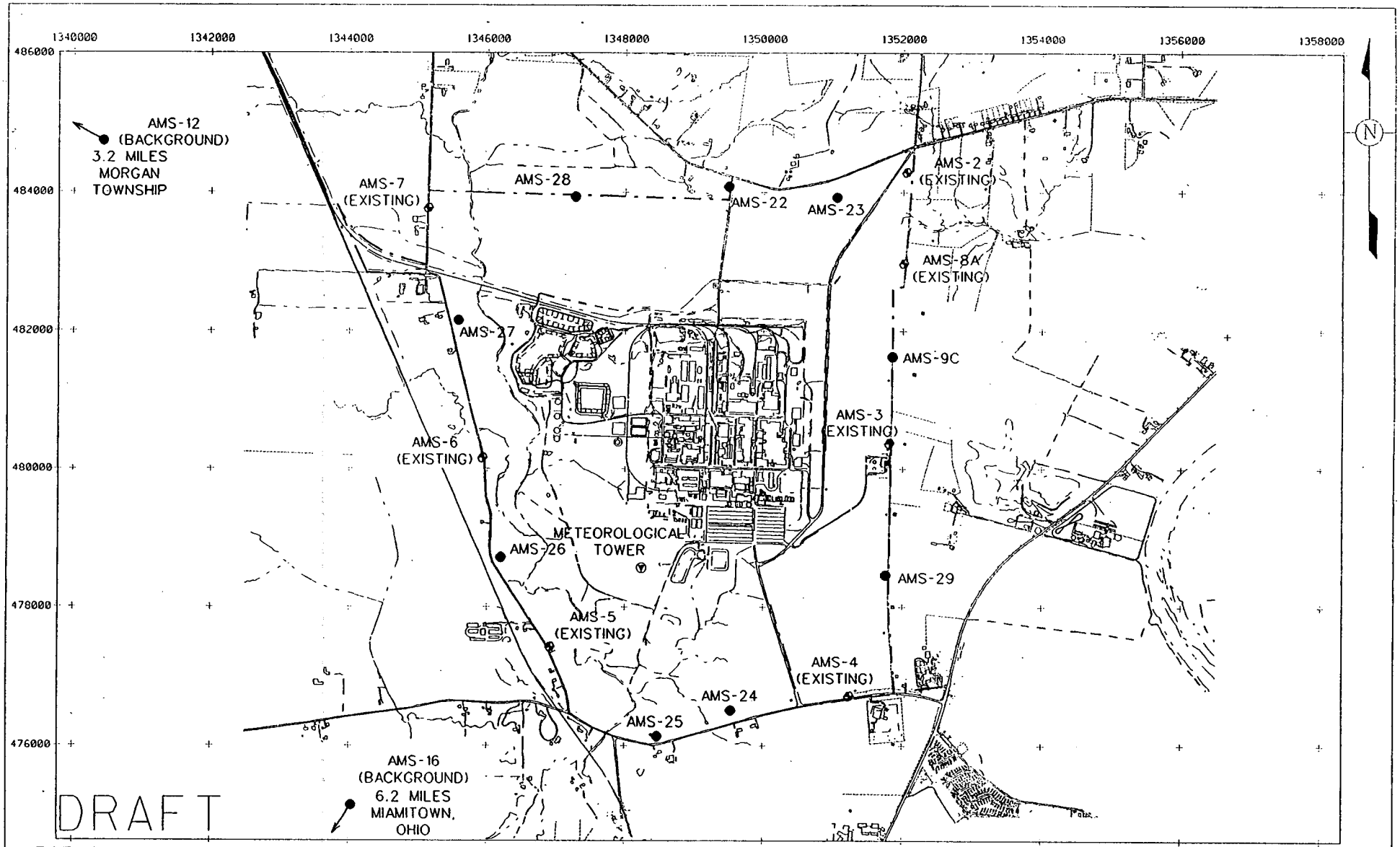


FIGURE 3-13. NESHAP STACK EMISSION MONITORING LOCATIONS



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STATE PLANAR COORDINATE SYSTEM 1983
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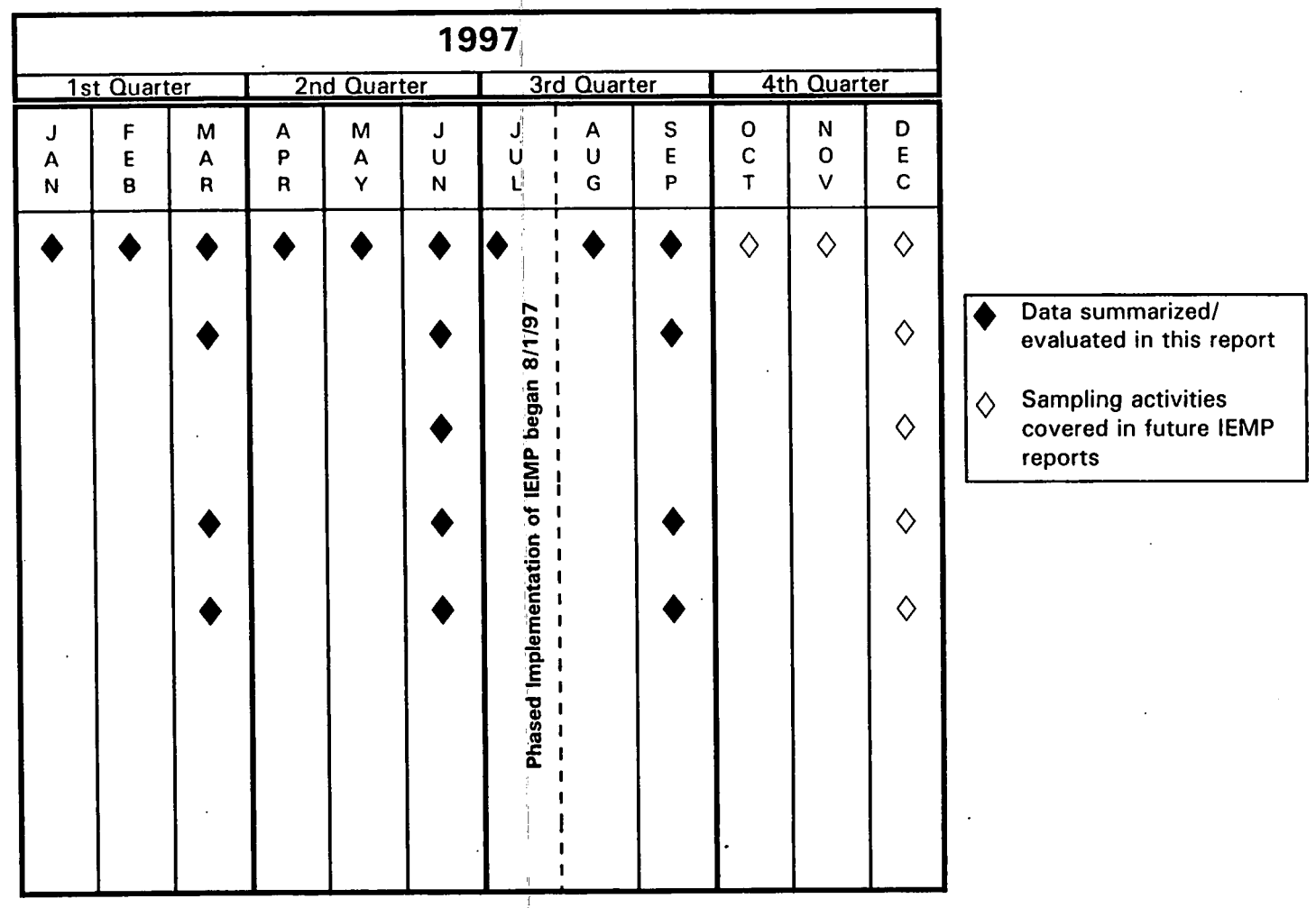
FIGURE 3-14. IEMP RADIOLOGICAL AIR PARTICULATE MONITORING LOCATIONS

FIGURE 3-15

AIR SAMPLING ACTIVITIES CONDUCTED IN 1997



[a]Biweekly results
[b]Reported to EPA and OEPA in the quarterly FFCA reports

4.0 NATURAL RESOURCES UPDATE

4.1 INTRODUCTION

Since sampling activities associated with natural resources are not set at a specific sampling frequency or schedule, as is required in the other medias, diamond charts will not be included in this section. This section provides a status of the natural resource monitoring activities conducted under the Natural Resource Impact Monitoring Plan (included as Appendix D of the IEMP). The information provided covers January 1, 1997 through September 30, 1997 and fulfills the reporting requirements outlined in Section D.5.0 of the IEMP by providing a summary of the following natural resource monitoring activities:

- Sloan's Crayfish - Visual observation of turbidity in Paddys Run (Table 4-1 and Figure 4-1)
- Cultural Resources - Identification of unexpected cultural resource discoveries uncovered during remediation activities (Table 4-2 and Figure 4-2)
- Impacted Habitat Acreage - Ground-truthing of impacted habitat using a Global Positioning System or by visual observation of impacted habitat (Table 4-3 and Figure 4-1)
- Wetland delineation - Identification of additional on-property jurisdictional wetlands (Figure 4-3)
- Threatened and Endangered Species Surveys - No surveys conducted for Indiana Bat, Running Buffalo Clover or Spring Coral Root since no remediation activities occurred within areas of concern (Figure 4-1).

4.2 SLOAN'S CRAYFISH

The Sloan's Crayfish, a State of Ohio listed threatened species, prefers streams with rocky riffle habitat and medium flow, and is sensitive to stream siltation. A well established population of the Sloan's Crayfish is found at the FEMP in the northern reaches of Paddys Run. The Sloan's Crayfish Management Plan (Attachment D.1 of the IEMP) requires visual inspections of sediment loading in Paddys Run in the vicinity of the northern drainage ditch within 24 hours of a rain event (Figure 4-1). A rain event is defined as a single storm that produces at least 0.5-inch of precipitation. As specified in the Sloan's Crayfish Management Plan, if the northern drainage ditch causes sustained (four to five days) increased sedimentation to downstream Sloan's Crayfish habitats in Paddys Run, then alternatives such as crayfish relocation will be considered.

Results of visual field observations indicate that sedimentation from the outflow of the northern drainage ditch has not impacted Sloan's Crayfish habitats in Paddys Run (Table 4-1). When turbid conditions were observed, the turbidity was observed to be a function of upstream influences unrelated to site activities. These turbid conditions persist for only one day or less following each rain event. The visual observations associated with sedimentation and turbidity support the finding that existing site storm water controls and associated inspections of these controls are adequate for addressing potential impacts to Sloan's Crayfish habitat and indicate that sediment loading is primarily derived from upstream reaches of Paddys Run rather than the FEMP. Based on these findings, it is recommended that visual monitoring of sediment loading to Paddys Run in response to storm events be discontinued, unless storm water control inspections indicate that sediment controls are not functioning properly. The routine inspections associated with storm water controls will continue and provide the necessary measure of protection ensuring that the Sloan's Crayfish habitat is not adversely impacted.

4.3 CULTURAL RESOURCES

There were five unexpected discoveries encountered during remediation activities (Table 4-2 and Figure 4-2) in accordance with site procedure EP-0003, "Unexpected Discovery of Cultural Resources." Based on "the best professional judgement," the unexpected discoveries were not of a level of significance to prompt data recovery.

4.4 IMPACTED HABITAT

There are five habitat areas monitored for impacts: Northern Woodlot/Pines, Southern Pines and Waste Units, Grassland, Paddys Run Corridor, and Wetlands associated with the Waste Pits/Process areas. The extent of each impacted habitat area was surveyed using a Global Positioning System (Figure 4-1) or by visual observation in the case of wetlands associated with the Waste Pits/Process areas. The impacted habitat acreage is summarized in Table 4-3. Projected acreage impacts are derived from the future impacts outlined in Section 3.0 of the Natural Resource Impact Assessment (DOE 1997d). The total habitat acreage impacted is approximately 85 acres (28 percent) of the projected 305 acres expected to be impacted by remediation activities.

4.5 DELINEATION OF ADDITIONAL WETLANDS

A letter dated August 18, 1997 was submitted to EPA and OEPA regarding the identification of wetland areas which occurred after the approved wetland delineation in August 1993. Approximately 0.5 additional acre of on-property jurisdictional wetlands was delineated. One wetland area is located west of the trailer parking lot along the access road to Building 45 (0.37 acre) and the others are immediately west of the sewage treatment plant (0.13 acre). Refer to Figure 4-3 for the locations of these additional wetland areas. The 0.37 acre wetland is located within the Southern Pine/Waste Unit Area and the 0.13 acre wetland is located within the Grassland Area. These additional wetland areas were identified after the approval of the sitewide wetland delineation by the Army Corps of Engineers in August 1993. Impacts to these wetland areas will be identified in future revisions of the Natural Resource Impact Assessment.

Approximately 10 acres of impacted jurisdictional wetlands were identified in the Natural Resource Impact Assessment. These wetlands are located within the 173 acre footprint of the Waste Pits/Process areas and were impacted from dredge and/or fill activities associated with remediation. Figure 4-1 shows the general area of the wetlands associated with the Waste Pits/Process areas and Table 4-3 identifies the acreage impacted.

4.6 THREATENED AND ENDANGERED SPECIES SURVEYS

No surveys were conducted for the Indiana Bat, Running Buffalo Clover, or Spring Coral Root because no remediation activities occurred within their respective habitat areas. Figure 4-1 presents the actual and potential location of these species.

4.7 FINDINGS AND FUTURE FOCUS

The principal findings from the reporting period are summarized below:

- **Sloan's Crayfish Monitoring**

  Extensive monitoring to determine the persistence of sediment loading to the creek in the vicinity of the Sloan's Crayfish habitat indicates that sediment loading following rainfall events is primarily derived from the upstream reaches of Paddys Run rather than the FEMP. Monitoring observations indicate the sediment loading persists for only one to two days following the rainfall event; therefore, it is proposed that the ongoing monitoring of sediment loading to Paddys Run as described in Section D.3.0 of the IEMP be eliminated.

- **Impacted Habitat**

  To date, the impacted habitat comprises approximately 85 acres (28 percent) of the projected 305 acres expected to be impacted by remediation activities.

- **Cultural Resources**

  There were a total of five unexpected cultural resource discoveries. None were significant enough to require additional data collection.

- **Delineation of Additional Wetlands**

  A total of approximately 0.5 acre of jurisdictional wetlands was identified during January through September 1997. These additional wetland areas were identified after the approval of the sitewide wetland delineation by the Army Corps of Engineers in August 1993. Impacts to these wetland areas will be identified in future revisions of the Natural Resource Impact Assessment.

Future monitoring will be inclusive of the above-mentioned natural resources with the possible exception of the sediment loading inspections related to Sloan's Crayfish.

TABLE 4-1

SLOAN'S CRAYFISH MONITORING

Date	Precipitation (Inches)[a]	Visual Observation	Action
2/05/97	1.37	High flow, no turbidity	No further action
3/03/97	2.16	High flow, turbid upstream and downstream of ditch	Monitor 3/4/97
3/04/97	0.33	Flow reduced, no turbidity	No further action
3/10/97	0.70	Medium flow, no turbidity	No further action
3/14/97	0.80	Medium flow, no turbidity	No further action
3/20/97	0.50	Medium flow, no turbidity	No further action
3/31/97	0.69	Medium flow, no turbidity	No further action
5/01/97	0.76	Medium flow, slight turbidity upstream and downstream of ditch	No further action
5/05/97	2.00	Medium flow, slight turbidity upstream and downstream of ditch	No further action
5/27/97	1.92	Medium flow, slight turbidity upstream and downstream of ditch	No further action
6/02/97	3.52	Medium flow, slight turbidity upstream and downstream of ditch	No further action
6/09/97	2.40	High flow, turbid upstream and downstream of ditch	Monitor 6/10/97
6/10/97	0.37	Flow reduced, no turbidity	No further action
6/17/97	1.22	Medium flow, slight turbidity upstream and downstream of ditch	No further action
7/24/97	0.56	Low flow, no turbidity	No further action
8/18/97	2.31	Low flow, slight turbidity upstream and downstream of ditch	No further action

[a]Precipitation values are 24-hour totals for the day previous to monitoring, but may be cumulative over longer periods of time (i.e., rain events over a weekend).

TABLE 4-2

UNEXPECTED DISCOVERIES

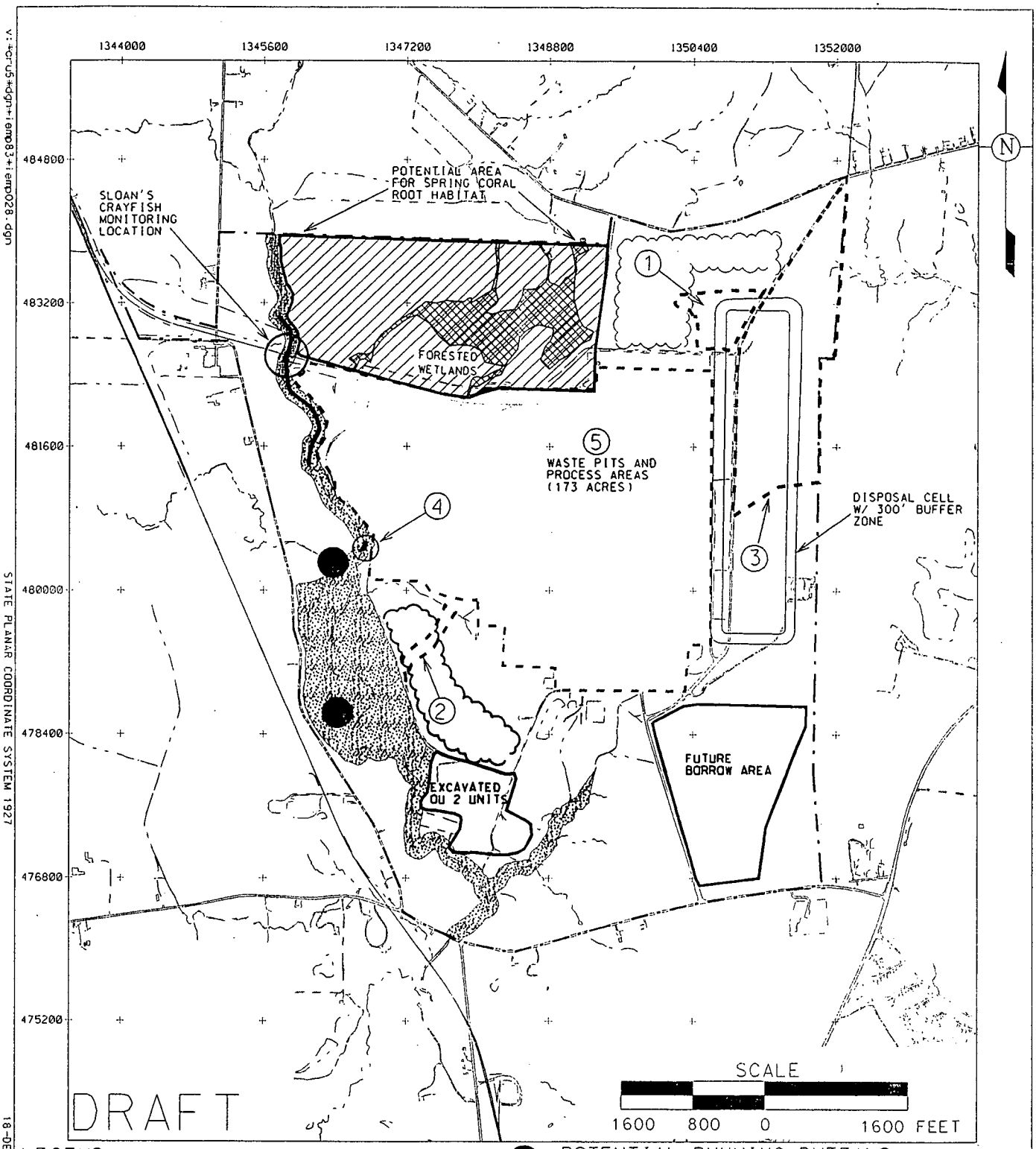
Date	Location	Unexpected Discovery	Action
2/97	East Field	Chert Blade (Prehistoric affiliation. Age unknown)	No Data Recovery
5/97	East Field	Kirk Corner Notched Cluster (7500 to 6900 B.C.)	No Data Recovery
6/97	East Field	Unnotched Pentagonal Cluster (A.D. 500 to 1000)	No Data Recovery
6/97	East Field	Spear Weight (10,000 B.C. - 1,000 A.D.)	No Data Recovery
8/97	East Field	Bone Handle (Prehistoric affiliation. Age unknown)	No Data Recovery

TABLE 4-3

IMPACTED HABITAT AREAS

Number [a]	Habitat Area	Impacted Acreage (approx.)	Projected Acreage Impacted[b] (approx.)	Percentage of Projected Impact	Total Acreage	Activity Associated with Impact
1	Northern Woodlot/Pines	9 acres	40 acres	23	162	Construction of OSDF
2	Southern Pines and Waste Units	2 acres	17 acres	12	66	Construction of waste haul road
3	Grasslands	64 acres	204 acres	31	235	Soil certification of Area 1, Phase I and construction of OSDF
4	Paddys Run Corridor	0.069 acre	34 acres	<1	98	Development of near-vertical slope from continued erosion
5	Waste Pits/Process Area (Wetlands)[c]	10 acres	10 acres	100	10	Dredge and/or fill activities
	Total Impact (as of September 1997)	85.069 acres	305 acres	28		

[a]These numbers are associated with Figure 4-1.
[b]Derived from the future impacts outlined in Section 3.0 of the Natural Resource Impact Assessment.
[c]There are 173 acres associated with the Waste Pits/Process areas; however, only 10 acres are wetlands.



LEGEND:

- FEMP BOUNDARY
- RIPARIAN CORRIDOR
- SLOAN'S CRAYFISH AREA
- INDIANA BROWN BAT HABITAT
- WETLANDS
- NORTHERN WOODLOT AREA
- PINES
- POTENTIAL RUNNING BUFFALO CLOVER AREAS

IMPACTED HABITAT AREAS:		ACREAGE:
1	NORTHERN WOODLOT/PINES	9
2	SOUTHERN PINES/ WASTE UNITS	2
3	GRASSLAND	64
4	PADDYS RUN CORRIDOR	0.069
5	WETLANDS ASSOCIATED WITH WASTE PITS/PROCESS AREA	10

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STATE PLANAR COORDINATE SYSTEM 1927

18-DEC-1997

FIGURE 4-1. HABITAT MONITORING MAP

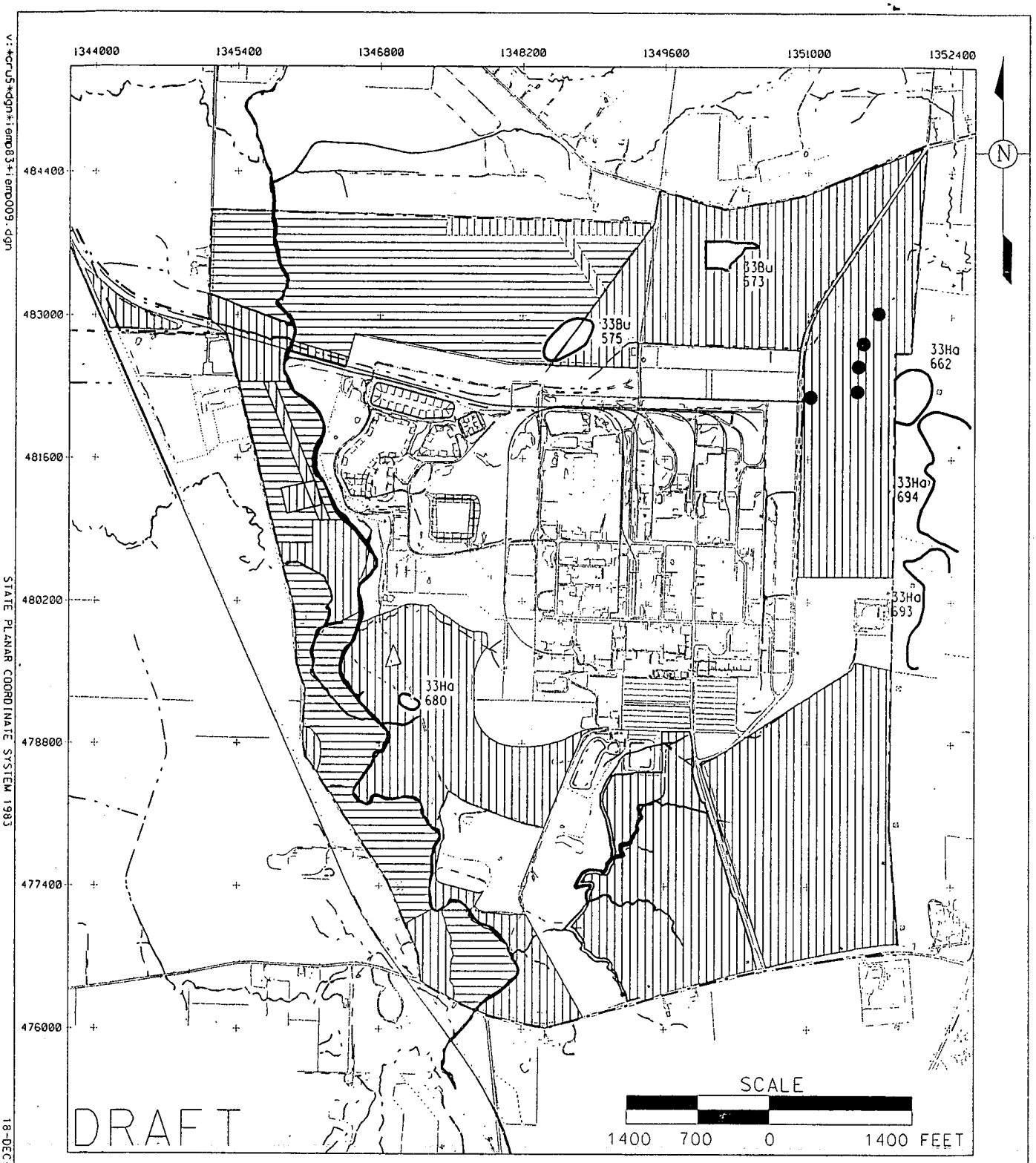
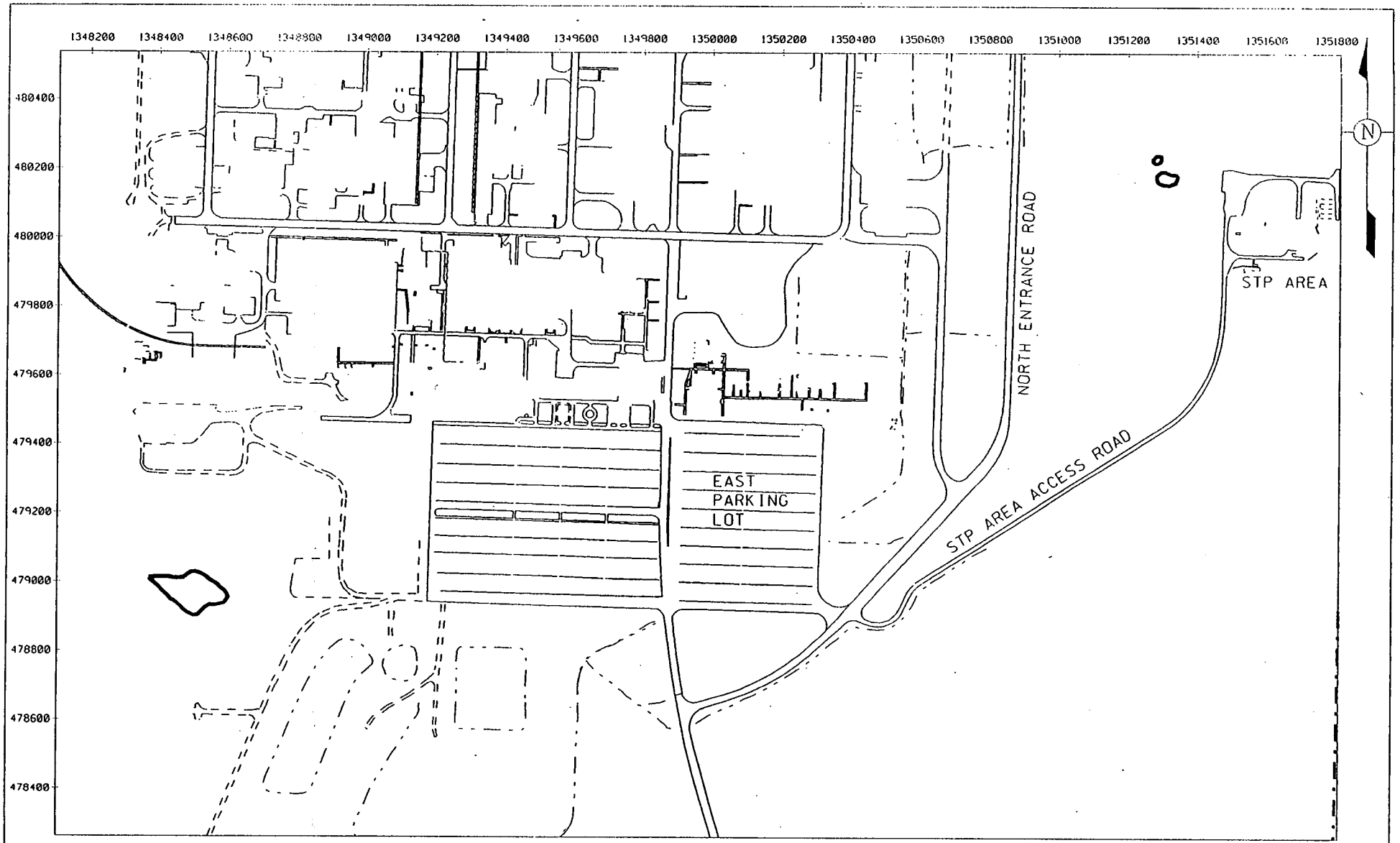


FIGURE 4-2. CULTURAL RESOURCE SURVEY AREAS



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STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 4-3. ADDITIONAL WETLAND AREAS

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